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Hugh Cecil Earl of Lonsdale.

1823.

157 A Series of Elementary Lectures on the Veterinary Art: wherein the Anatomy, Physiology, and Pathology of the Horse are essayed on the general principles of Medical Science. By Veterinary Surgeon **Percivall**, of the Royal Regiment of Artillery.

"To watch, to scrutinize, to inquire, is labour, and labour is pain. To confide, to take for granted that all is well, is easy, is exempt from labour, and, to the great mass of mankind, comparatively delightful."—*Mills' History of British India.*"

"Those who seek truth only freely expose their principles to the test, and are pleased to have them examined."—*Locke.*

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Dedicated to the Veterinary Medical Examining Committee, etc.

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1823.

ENTERED AT STATIONERS' HALL.

TO THE

Veterinary Medical Examining Committee,

AND TO THOSE

ERRATA.

Page 20, *line* 31, *dele* the.
—— 30, *line* 24, *for* or, *read* and.
—— 51, *line* 24, *dele* any.
—— 58, *line* 5, *for* escarotic, *read* escharotic.
—— 119, *line* 33, *for* innoculated, *read* inoculated.
—— 120, *line* 2, *for* innoculation, *read* inoculation.
—— 177, *line* 2, *for* extensie, *read* extensive.
—— 186, *line* 6, *for* supercede, *read* supersede.

By their most devoted Servant,

THE AUTHOR.

TO THE

Veterinary Medical Examining Committee,

AND TO THOSE

DISTINGUISHED TEACHERS

OF

HUMAN MEDICINE,

WHO,

WITH LIBERALITY UNPRECEDENTED,

Have gratuitously opened to

The Veterinary Pupil,

THE

SOURCES OF HIS FUNDAMENTAL MEDICAL KNOWLEDGE,

THESE LECTURES

Are inscribed, in testimony of

RESPECT, ESTEEM, AND GRATITUDE,

By their most devoted Servant,

THE AUTHOR.

PREFACE.

AN elementary work on veterinary subjects, should it be deemed worthy of a place among the many approved introductions to various other branches of science, has little need of commendation, and none of excuse, in making its appearance before the public. Too long have the members of the profession experienced the inconvenience of not having by them some accurate synopsis of the scattered elements of their art; too long, indeed, have the medical profession in general looked forward to some scientific production of this nature.

But, could we plead this pressing demand—this desideratum in veterinary literature, as an apology for obtruding ourselves thus early upon public notice, it might still be regarded as an unqualified act in us, to attempt the exposition of the principles of an art of which the professors themselves have only published on detached parts. Conceiving, however, that the present essays, (in the form of lectures,) concise as they confessedly are, might prove useful in the absence of more elaborate composition, and daily witnessing the pernicious influence of books on farriery, written by individuals unacquainted even with the rudi-

ments of the art they treat on, we have ventured, notwithstanding the above acknowledged truth, we fear prejudicial to them in the minds of some, to lay them, in their present state, before the public.

Having offered our reasons for undertaking a work, we hope, at some future period, to be able to complete; it only remains to crave for it, that liberal examination, and indulgent censure, for which those eminent characters, to whose protection we have consigned it, are so universally and so justly esteemed: assuring them, that, however unfinished the superstructure may be found, the foundation has been laid in practical investigations, anatomical and pathological, in an ample field of observation and experience.

Royal Horse Infirmary, Woolwich,
May, 1823.

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INTRODUCTION.

THE VETERINARY ART, according to its present acceptation, comprehends a knowledge of the external form, as well as the internal structure and economy, of our principal domestic quadrupeds; their appropriate management; the nature, causes, and treatment of their diseases; and the art of shoeing such as require it.

The horse, and his varieties—the mule and ass, the dog, the ox, the sheep, the pig, and some others, come equally under the ministering hand of the veterinary surgeon: the comparative value however of the horse, designates him as the object of his *primary*, we had almost said his *sole* consideration; so that the rest, regarded as another and an inferior class, have but little of his time or study devoted to them.

The veterinary art, become a science, alone preceded in practical benefit by that of medicine, of which it is a luxuriant and aspiring branch, has for its objects the preservation in health, and restoration from disease, of an animal nearest to man himself in the scale of animated

nature; whether we contemplate his beauty, his worth, or his general and extensive use. Perhaps no age, nor country, has so elevated the horse beyond the common level of the brute creation as this: he is housed, clothed, and fed, at a cost only exceeded by that appropriated to his master, to whose gains he is instrumental, or to whose diversions he is indispensable; his life is watched with a peculiar care, and his loss too often irreparable. If the veterinary art be estimated as beneficial and important in exact ratio to the value of the animal to whose well-being all its objects are directed, surely at no antecedent period has it merited the same degree of encouragement as at the present: should we, therefore, not have been successfully engaged in our efforts to cultivate and improve it, let us hope, at least, that such attempts are deserving of commendation!

Had it not been for the fostering patronage of some of the most exalted characters in this country, the veterinary art must still have lain prostrate at the feet of ignorance and superstition; no less a personage, however, than our magnanimous King himself, ever distinguished for promoting that which is nationally useful and beneficial, has deigned to raise it into importance and respectability, in appearing as the Patron of the Veterinary College. Were not this of itself full and sufficient testimony of the present consideration of our art, we might adduce that very respectable and honorable list of governors of the insti-

tution, the bare perusal of which will evince, that the nobility, the talent, and the wealth of our nation, have subscribed to its protection, its advancement, and its diffusion.

But let us descend a little into detail—we shall find, by pure and plain matter of fact, that, prior to its being grafted upon the luxuriant stock of science, great numbers of our horses became prematurely unserviceable: the natural consequence of which was heavy and continual national expenditure; not to glance at the ineffective state to which our cavalry and other horse departments were necessarily reduced. Let us take, by way of example, the present system of shoeing horses. In the course of a long experience we have ascertained, that, by a skilful performance of this branch of our art, we can prevent many of the diseases, and them the most formidable, to which the foot of the horse is liable; enable horses to go with ease to themselves, and safety to their riders; and preserve them to use to a much longer period than heretofore. On the other hand, to sketch a picture of the melancholy effects resulting from the practice of shoeing in the hands of professionally unscientific persons, when the horses belonging to the Honorable Board of Ordnance were first placed under the superintendance of veterinary surgeons, numbers of them, highly valuable in other respects, *were cast for death purely because their feet were incurably diseased.* Thrush, and its sequel canker, corns,

grease, and all those varieties of disorganization induced by mal-treated inflammation of the parts within the hoof, consigned multitudes of them to the knacker's knife: whereas, since the eye of science has controled the hand of the smith, we will venture to assert, *that not a single horse has been lost to the service from either of the above-named diseases; and that at the present day the three first* —viz. *thrush, canker, and corns, are almost unknown; and the last of so rare occurrence, that there are not admitted into the Infirmary a dozen cases in the course of the year.* We might bring forward here many—very many other instances of the benefit, not more obvious than great and permanent, the country has experienced from the practice of our art under the direction of those acquainted with its principles: but we trust that the one here adduced, which a reference to recorded statements will at any time evince the truth of, stands in need of support from no concomitant, nor lacks confirmation from any corroborative evidence.

To the breeder—to the proprietor of a large stud*—to the gentleman of the turf—and to every individual who feels an interest in the well-being of his horse, the veterinary art cannot but appear in a most favorable light. The first, by enabling him to trace out the perfections and

* By the word *stud* is popularly and here meant, *a collection of horses* simply.

imperfections of male and female, by developing the nature of those diseases to which each may be disposed, and by informing him what are and what are not ingenerate, it renders competent to produce, by certain unerring laws, an improved and matchless progeny; to the second it is both useful and profitable, in teaching him the means of prevention, as well as those of palliation and cure, of disorder in his stud; the third it fills with renewed hope, in having restored to the goal of contention, his broken-down but celebrated racer; the last it contributes in no trifling degree even to the happiness of, in administering to those maladies which his old and favorite horse may have contracted in his service.

To the enlightened practitioners of medicine of the present day, we need say but little to convince them, that veterinary inquirers may, from time to time, by extensive opportunities in comparative anatomy, add something to the general fund of medical knowledge; and that, so far, they may now and then consult veterinary works with advantage. Indeed, so much analogy is there throughout, between the structure and economy of the horse and those of the human subject, and so alike are the chief phenomena of pathology, that the surgeon has but little to do to become the veterinary surgeon, though the converse of this, unfortunately for the latter, by no means obtains. And where is the surgeon who would not himself direct the treatment of his sick or lame horse, in pre-

ference to calling in the village blacksmith?—a man whose knowledge is necessarily confined to that of nailing the shoe to the foot? He would not permit a shoemaker to visit one of his own patients, why should he allow the blacksmith to prescribe for his horse? The *theory* of medicine in the human subject, is the theory of medicine in the brute; it is the application of that theory —the *practice* alone that is different: whether we prescribe for a man, or a horse, a dog, or a cat, the laws of the animal economy are the same in all, and one, and that an unerring system of principles, built upon ascertained and established truths, is to dictate our practice in all. We might as well, in reference to the principles of each, attempt to separate surgery from medicine, as insist that either of these arts, in *theory*, is essentially different from the veterinary: every day's experience only serves to confirm this—our belief; in shewing us how often the diseases of a horse arise from the same causes as those of a man, exhibit the same indications, and require a similar method of cure. Were this not true, how is it that the testimonial for practice—the diploma of a *veterinary* surgeon, owes its stamp of importance and indisputable qualification to the signatures of practitioners of *human* medicine? Will it be said, that these distinguished characters are, as physicians and surgeons, unacquainted with the principles of veterinary science? This is no new doctrine—it has not originated in our time: VEGETIUS,

fourteen hundred years ago, when he was collecting materials for his work, *De Arte Veterinariâ*, wisely, not only consulted the veterinary surgeons, but also the physicians of the day; nam (inquit) mulomedicinæ doctrina ab arte medicinæ non adeo in multis discrepat, *sed in multis plurimisque consentit.*

The advantages resulting to the veterinary surgeon from a knowledge of the different branches of human medicine, can alone be duly appreciated by its possessor: without it, he is but ill prepared to meet the medical literati of the day; with it, he stands as an effectual barrier to improper interference on the one side, and to the dissemination of doctrines flimsy or absurd, on the other. The young veterinarian we would admonish to be very cautious how he admits empiricism into his counsel—how, in other words, he practises that which his judgment may condemn: *pin your faith upon no man's sleeve, but look for yourself as you proceed,* is inscribed on the direction-post which points out the road to professional celebrity. To the old practitioner we would fain hint, that nothing is so effectual a barrier to advancement—nothing so prejudicial to the art, as to continue in the use of remedies purely because they were the *infallibles* of those who went before: let him be wary how he vainly piques himself of his experience; for he who reposes himself on practice, to the utter exclusion of theory, we do not care what his experience may be, is but a dabbler in the

art, and one that tampers with the lives of animals unfortunate enough to be placed under his care *.

In order to convey some idea of the present state of veterinary science, it may not be amiss to take a hasty retrospective view of our art, from the institution of the Veterinary College. This establishment may be said to have had its origin in the Odiham Agricultural Society; who, in the year 1785, first occupied themselves about the improvement of the veterinary art, then in a very neglected condition: it is M. Sainbel, however, who came over to England in the following year, with a view of publicly teaching it, and who afterwards became professor, whom we must regard as the *founder of the College*. We

* We recall to memory here an anecdote so pertinent to this part of our subject, that we cannot forbear relating it. A farrier who was subpœnaed on a horse-cause, was opposed, as evidence of the contending party, by a young veterinary surgeon. The son of Vulcan, who had from the beginning eyed his professional antagonist with all the spleen and self-sufficiency so peculiar to his sect on such occasions, as one of comparative ignorance, when put in competition with him, the possessor of grey hairs and venerable looks, during his examination by the counsel, to whom he was replying in a most haughty and assuming tone, was asked by the judge, "and pray, sir, how long have you been a farrier?" to which our hero, astonished that his lordship had not heard of his professional fame, nor of that of his progenitors, answered, "how long a farrier, my lord! I was *born a farrier*, my *father* before me was a *farrier*, and so was my *grandfather!!!*"

may consider this, therefore, as the epocha of scientific farriery in England; though, long before, there had been much written on the subject, particularly by the French, who, for a considerable time anterior to this, led the way in veterinary pursuits; which only required selection and arrangement, by a person of good discriminative talent, and sound medical knowledge, to convert it into materials fully sufficient for laying down the rudiments of veterinary science. To the lot of Mr. COLEMAN, the successor of M. SAINBEL, and present professor to the College, fell this gratifying task: what professional fame this gentleman has acquired in its acquittance, or with how much respect and esteem he is looked up to by the members of the institution for the services he has rendered it, need not be the theme of our pen. Seeing, then, that there was much useful, though imperfectly digested matter to be obtained from the perusal of works on farriery *; and that to this was to be added all that had any relation to the art in comparative anatomy, physiology, chymistry, human surgery and medicine, which were at that time, and have been ever since, making rapid strides

* From a long list of French authors we may adduce, SOLLEYSEL, BOURGELAT, LA FOSSE, VITET, and SAINBEL, as excellent sources of practical information: among numerous of our own writers on farriery, &c. BLUNDEVILLE, MARKHAM, NEWCASTLE, SNAPE, GIBSON, BRACKEN, BARTLETT, OSMER, CLARKE, and STUBBS are the principal contributors.

in advancement, we shall find that our art was susceptible of very considerable improvement, in a very short space of time; and that we ought not to be at the present day, remembering that this happened thirty years ago, so young and inexperienced in the practice of it as many seem inclined to believe. It is now quite time that we were acquainted with the anatomy and physiology of the horse, so far as our practice demands; and it is to be hoped that we are making daily progress in our pathological knowledge: though this last is a branch of comparative slow growth, and one that is peculiarly shy of bringing forth fruit. We shall, at another time, prosecute an inquiry into the existing state of veterinary science in this country; consider the national means provided for its improvement and diffusion, in the establishment of the College; analyze the system of education therein pursued, comparing it with those now adopted at the principal continental veterinary schools, and with that originally proposed by M. SAINBEL; ascertain what progress has absolutely been made, notice the discoveries, and endeavour to trace each to its respective and proper source; and offer such hints and suggestions for the further benefit and advancement of our art, as strike us not to be unworthy the attention—nay, serious consideration of those more immediately concerned in the welfare and promotion of this very useful branch of general knowledge.

It is far from our intention here to enumerate the "*discoveries*" that have been made, even in our own time; suffice be it for the present to observe, that, with the powerful aid of our cotemporaries in medicine, whose path is our nearest way to perfection, we are rapidly effecting a complete revolution in the veterinary art. We have had, and we still have, great obstacles to contend with:—prejudice, envy, obstinacy, and ignorance; we hope, however, to find none of them insurmountable; on the contrary, in process of time, as we advance in knowledge and importance, to tread them one and all under foot. Let us act towards one another as become the respectable members of a liberal profession, engaged in one common cause, whose promotion is the interest and the benefit of us all—let us go hand in hand, and unanimously and resolutely oppose the incursions of that individual who would sell our present rank and prospective preferment to fill a private purse; while we unsparingly lavish our praises and our honors upon him, who, in being a real and unsophisticated friend to our art, contributes to the welfare and advancement of every one of us.

Although we abstain from, indeed our limits will not admit of our making mention of the progressive improvement the art has undergone, even since the foundation of the College, we shall take a hasty review of the principal literary productions of the professors and members of the institution.

Charles Vial de Sainbel, the founder of our College, now no more, if we are to repose faith on what he wrote, and on what he had but time to lay the foundation stone of, had great and important designs indeed in view, to the aggrandizement of veterinary science. His career, however, was of so short duration, that he has only left us—besides an excellent and unpractised plan for the education of éléves vétérinaires—a work, translated into English, containing some very pithy *Observations on the Art of Veterinary Medicine; an Essay on the Proportions of Eclipse;* another, which obtained a prize given by the Royal Society of Medicine, *on the Grease and Watry Sores on the Legs of Horses;* a third, *on the Glanders;* and a few short *Observations on the Cholic, or Gripes.* That Sainbel, had he lived, would have proceeded on sound principles, may be inferred from his fourth observation on the veterinary art. "The object of this art is therefore not only congenial with that of human medicine, *but the very same paths which lead to a knowledge of the diseases of man, lead equally to a knowledge of those of brutes.* An accurate examination of the interior parts of their bodies, a studious survey of the arrangement, structure, form, connexion, use, and relation of these parts, and of the laws by which they are intended to act, as also of the nature and property of the various foods, and other agents, which the earth so liberally provides for their support and cure; *these form in a great*

measure the sound and sure foundation of all medical science, whatever living individual animal is the subject of our consideration."

First in the catalogue of works of more modern veterinary writers, in volume and importance, presents itself that of Professor COLEMAN; wherein the *Structure, Economy, and Diseases of the Foot of the Horse, and the Principles and Practice of Shoeing*, are treated of with great clearness and ingenuity: the descriptive part is well illustrated by several highly finished paintings. Messrs. MOORCROFT, BRACY CLARK, GOODWIN, BUDD, and POWIS, have also written on this subject. Mr. GOODWIN, whose is a good practical work on shoeing horses, has given us a synoptical display of the various methods adopted, in this branch of our art, by different nations; and introduced some modification in the present practice of it; which, in our opinion, will be sooner or later carried into effect; even by the adherents to other systems; and may be so, we also think, without any concession of their present tenets.

Professor PEALL has published some *Observations on the Diseases of the Horse, and his Stable Management*; unrivalled by any book of the kind, either for the practical matter it contains, or the liberal and scientific style in which it is written.

Mr. BRACY CLARK has presented us with an interesting *Essay on the Bots of Horses and other Animals*; wherein the transformations, and other curious incidents

connected with the natural history of that little animal, are with much science and research developed to us. The same writer has published another *Essay on the Gripes of Horses;* and, more recently, a work entitled, *The Reformed Veterinary Pharmacopœia.*

Mr. SEWELL, assistant professor to the college, we believe every member of the profession will attest, has long and unremittingly exerted himself in the augmentation of veterinary knowledge; and, we feel pleasure in adding, with no ordinary success. Among other innovations in practice, of small comparative import, we must not lose sight of the operation, called *neurotomy*, the merit of which is the exclusive right of Mr. SEWELL. It is illiberal! it is *false*, to assert that it is not! But Mr. SEWELL has treated the *groom's oracle** with deserved contempt——with silence.

The following members of the institution have also become authors; some of *general treatises*, others of *essays, dissertations*, &c. the bare mention of whose names we must be content with here, or we shall extend these preliminary observations much beyond their prescribed limits: *viz.* Messrs. BOARDMAN, LAWRENCE, WILKINSON, SHIPP, SMITH, RYDING, FERON, BURKE, and DENNY.

* *Treatise on Veterinary Medicine in four volumes*, &c. &c. by JAMES WHITE, late Veterinary Surgeon to the First or Royal Dragoons. Vide Vol. III. p. 148 of the 13th edition.

Science, then, may at length be said to have dawned on the veterinary art—society has, now, long regarded it as one of adequate utility to merit its support and encouragement—the Veterinary College has been established thirty years, and has dispersed its members throughout the united kingdom. Notwithstanding all this however, had not others, under less favorable circumstances than our own, have been well received upon the arena of public decision, we should not yet have ventured to have made our appearance at the same tribunal.

It has been said, and with much truth, that he who would be of essential service to the profession as an author, should take up the investigation of one subject, and confine himself to that alone: thus has medicine attained its present pre-eminence in this country. It appears to us however, that, before any science, or art, can make great progress, it is requisite that every member of it be furnished with a synopsis of the fundamental principles of that science, or art; and that, for the want of such implements, many are deterred from lending their aid, who would otherwise prove very useful laborers in the vineyard. To this end, it is not enough that these rules for their guidance be propounded to them once, or twice, or even thrice; but it is absolutlely necessary that there be some authentic records of them kept, accessible to every individual of the profession: so that the students may avail themselves of them in the absence of their teachers;

the members refer to them at pleasure; and the public in general be informed of the pretensions of its practitioners, by a display of that knowledge which they are, or ought to be, in the possession of.

No man supposes that his watch can be repaired at the anvil, though there be those who send their horses to the blacksmith to be cured of their disorders: they know that this blacksmith is unacquainted with the mechanism of a watch, and yet they intrust a machine to him, to which, in point of complication of structure, a rattle bears more affinity to a watch, than a watch to it! Why then are gentlemen so blind? Is it that a horse is of less value than a watch? No! It is that the vile trash diffused in *treatises on farriery,* is so truly disgusting to a man of common reflection, that he forms his opinions of the art by those he entertains of the book, and considers it specially adapted to the genius of his groom or coachman, or suitably lodged within the skullcap of his blacksmith or bell-hanger—below the dignity of a man of education, and incompatible with the habits of a gentleman! "Miserable animal!" says Sainbel, "bereft of speech, thou can'st not complain, when to the disease with which thou art afflicted, excruciating torments are superadded, by the ignorant efforts of such men, who, at first sight, and without any investigation to lead them to the source of thy disorder, pronounce a hackneyed, common-placed opinion on thy case, and then proceed with all expedition

to open thy veins, lacerate thy flesh, cauterize thy sinews, and drench thy stomach with drugs, adverse in general to the cure they engage to perform*."

To those who may regard the veterinary profession in other light than as one, not only deservedly established upon the basis of respectability, but, from its objects, necessarily requiring ability and a knowledge of medicine to practise with advantage, we would put the following questions of VEGETIUS; (a writer we have already quoted;) and then ask them, if these arguments, surely excellent, if not elegant of their kind, were tenable at that day, with how much more force and truth can we apply them at the present?

Quis aut nosse curas jumentorum erubescendum putet, cum optima jumenta habere gloriosum sit? Quis vituperationi det id posse curare, quod laudi ducitur possidere? Forsan ipsa opera mulomedicorum videtur abjectior, notitia aut curationis non solum honestissimis, sed etiam disertissimis convenit: ut provisione et ordinatione sollerti curatis animalibus et damnis careant, et voluptatibus perfruantur.

Highly respectable as every member of the law and divinity professionally is, and great as the honors are conferred on some of the most eminent, yet do we find in-

* Vide SAINBEL's *General Observations on the Art of Veterinary Medicine.*

stances, too numerous indeed, of chicanery and apostacy in both these professions: shall we then brand the veterinary art with stigma because one who professes it swerves from that course which circumspection might, and honesty ought to dictate? The man who barters his reputation for dirty pounds, shillings, and pence—be he who he may—whether he preside over or be a member of it, forfeits the confidence and good-will of a profession he living dishonors, and dead leaves a name, a blot in its history.

That individual has ever appeared to us as the most skilful and best practically informed veterinary surgeon, cæteris paribus, who is most familiarly acquainted with the natural habits of the horse, as well as those various states in which he is placed by art;—either in the *stable*, upon the *turf*, in the *field*, or upon the *road:*

"A skilful horseman, and a huntsman bred;"

and for the same reason, that he is regarded as the most able physician, who has well informed himself of the habits of life and constitution of his patient. In the selection of a hackney, for example, we should estimate that man's judgment at little, who was not only a good horseman himself, but who had not ridden a variety of horses of that denomination; nor should we consult him in the choice of a racer, who was not perfectly conversant in the trials and performances of horses of various breeds, and differ-

ent shapes; neither would we give him credit for any but fanciful knowledge of equitation, who could not set a sauteur in a school, or cross the country upon a well-trained hunter.

Let it not be understood, however, that we coincide with that system of education which would train up the éléve vétérinaire in a stable, or a blacksmith's shop, rather than initiate him in the different branches of literature: surely, the study of medicine in the horse involves nothing so *ecurien* in its nature as to render it necessary to be *stalled* for its attainment! The student of medicine receives clinical instructions, and is an attentive observer of the progress of disease; but it is neither requisite, nor advisable, that he should spend that time in the wards of an hospital, which he now, with such incalculably greater ultimate advantages, devotes to classical and other learning! Without a due share of practical knowledge, it is true, our medical acquirements are ever leading us into error; and this is the only excuse we can make for them who are eternally bewildering themselves in framing plans in the cabinet for the farrier to *look through* when they enter the forge. In fine, it appears that a happy combination of medical science with equestrian skill in the same individual, will eminently qualify him as a veterinary surgeon. Were the art intrusted to the first, it would, at no remote period, dissipate itself in speculation and refinement; and were it in the hands of the last,

it would rapidly sink again into that abyss of ignorance and blind humiliation, from which—and woe be to him who from sinister and selfish motives would again darken and enslave it—it is rising fast into the horizon of science. But to conclude these preliminary observations—

With all that was known prior to the institution of the College—with that vast accession of convertible science for which we are indebted to human medicine—and with what has since been added by later writers, we purpose to compile a regular course of lectures on the veterinary art; *parts* of which we shall submit from time to time, until the whole be completed, to the perusal of those desirous to acquire an elementary knowledge of it. For students we principally design them: should they, however, be deemed worthy of the attention of others, we shall feel amply repaid for our time and application.

The anatomical part of the work is taken from our own dissections—without adherence to the details of others.

The veterinary practitioner does not require so accurate an anatomy as the surgeon: he has seldom to cut down on an artery; never to amputate a limb. There are some parts of the animal, indeed, of which a knowledge would lead to little or no practical utility whatever: such are many muscles of the back, loins, neck, and head—the minute structure of the brain and nervous system— the precise course of blood-vessels removed from external injury, and some others.

Our physiology we adapt to the popular doctrines of the day.

To compose our pathology, we avail ourselves of the labors of those few who have written from their own observations; and we have copious notes of our own to refer to, as well as a large assemblage of records, collected by ourselves and others in the course of a very extensive practice of nearly thirty years duration, in the service of the Honorable Board of Ordnance.

Such are the materials we have the use of in the construction of our work, and such are our pretensions to public notice: our aim is to lay down *principles fundamental to the attainment of a knowledge of the veterinary art.*

Before we enter on the immediate consideration of these lectures, it will be proper to sketch an outline of their contents; and explain what we mean by the *anatomy, physiology, and pathology of the horse.*

In order to obtain a thorough knowledge of any science, it is expedient to commence with the most simple, and proceed progressively to the most complicated parts. This is the course pursued by our most eminent teachers of the anatomy and physiology of the human body; and it is that which we have observed in the compilation of these lectures.

Were the term *anatomy* strictly confined to its deriva-

tion, it would simply imply the *dissection of parts;* but, according to its present acceptation, we mean by it—*a knowledge of the structure of the component parts of an animal, and of separating and distinguishing those parts from one another.* Anatomy may be divided into *human*, and *veterinary*:—the former being that which restricts its inquiries to the human species; the latter, that which extends them to all our domestic animals, from the horse, its special object, downwards. From a comparison of the two, we derive *comparative anatomy.*

By *physiology*, we mean a knowledge of the actions or functions—the economy or use of parts.

As parts, by performing different actions from those which are natural to them, are altered in regard to their original structure, so we have a third division, termed *pathology.*

In order to elucidate these objects of inquiry, let us take some part of the body, and thus methodically examine it: say, for example, the *hoof*. We describe it to be of certain relative dimensions, and definite shape; to be divided into crust, sole, frog, and bars; to be composed of horny fibres, either regular or irregular in their course; and to be firmly attached to the parts within: all this is comprised in its *anatomy*. Its *physiology*, is that of containing and protecting the soft, or sensitive parts; of sustaining the animal's weight, and preventing slipping; and of expanding in due ratio to the force with which the

foot is put down, and thus counteracting the effects of concussion. By knowing its healthy appearances, we become acquainted with its morbid, or *pathological* conditions: we find it contracted, preternaturally upright, small, convex, flat, or concave.

The constituent parts of the body may be disposed in three classes. The first will comprehend the *organs of locomotion:*—the *bones* and *muscles.* The second, those subservient to *nutrition* and *sensation:*—the *viscera, blood-vessels,* and *absorbents*—and the *brain and nerves.* The third, those destined for the reproduction of the species:—the *parts of generation* in both sexes.

Anatomy, then, may be considered to be a knowledge of the materials, and of the manner in which these materials are connected in the construction of the animal machine. Its framework, that upon which all the other parts are distributed, to which they are attached, and by which they are sustained, is constituted of hard, inflexible parts, called *bones:* if an animal fracture one of the principal bones of the leg, its pillar of support being lost, the limb can no longer uphold the body. Bones, however, not only afford stability, attachment, and support to the other—the soft parts, but serve to contain the more important of them, and defend them from external injury: such as the brain, the thoracic, abdominal, and pelvic viscera.

By contrasting the skeleton with the living animal, we

mark the proportion which the bony fabric bears to the bulk of the whole body: we perceive that the bones, divested of flesh, form but an outline of the original animal. Now the flesh is divisible into a very considerable number of distinct portions, which anatomists call *muscles;* and these parts it is that we are to regard as the essential agents of motion: the bones are the passive, these are the active locomotive organs. To the muscles, the limbs chiefly owe their bulk and form; of them a considerable part of the trunk is composed; and by them all the motions of both are executed. They uphold the body while standing, move it from one place to another, and render it fixed at pleasure; they direct the eyes to the objects of vision, erect or depress the ears as befits the vibration of sound, and give motion to the jaws for the comminution of food: they are also the agents of respiration, and are concerned in a variety of ways with other important functions, a detail of which would be ill-timed in this hasty review of them.

Were the limbs composed of but two, or three bones, they would be but ill adapted to perform that variety and extent of motion which they now do, in transporting the animal from place to place; on the contrary, we find them, most wisely, to consist of several, differing in size and shape, so arranged and accommodated as to act with facility, and surprising rapidity: to give strength, and admit of speed, no less than one and twenty are found in

the fore extremity. The ends of bones, shaped so as to fit into each other, are covered by *cartilage*, better known by the name of *gristle;* and are fastened together by dense, fibrous cords, denominated *ligaments;* whose internal surface is lined by a *membranous bag*, containing what is called *joint-oil*—in technical language, *synovia*. Thus is constituted a *joint:* in the motion of which, the nice adaptation of the bones, and due tensity of their ligaments, prevent dislocation; the cartilages, like cushions of support, guard against concussion; while the synovia is a true joint-oil for the lubrication of the whole.

Next we come to take a view of those organs concerned in the maintenance of life. In order to furnish nutriment to the system, the animal, irresistibly compelled by the sense of hunger, takes in from time to time a certain proportion of food; which, after it has undergone trituration by the *teeth*, and has been moistened by *saliva*, is conveyed by the *esophagus*, or *gullet*, into the *stomach*. Here the several matters of which it consists are reduced to a soft, uniform mass, called *chyme;* and this is further converted within the *intestines*, into which the stomach impels it, by the admixture of different juices; the two most remarkable of which are furnished by the *liver* and *pancreas*—the *bile*, and *pancreatic fluid*. At this time, a milky and highly nutritive essence separates itself, and is absorbed by numberless capillary tubes, called *lacteals*, and conveyed by them into the system; while the resi-

duary matters, feculent in their nature, continue their route through the guts to be expelled at the *anus*.

The blood, the nutritive fluid to the animal as the sap is to the vegetable, is conducted to every part of the body by a system of vessels, named *arteries;* whence it is re-conveyed to the heart by others, similar in composition and distribution, called *veins;* and this perpetual motion of it, is what we denote by the term *circulation*. Having, however, once performed this circuit, wherein it has served the purposes of nourishment, growth, and reproduction, and supplied the various secretions—such as *bile, semen, urine,* and *saliva,* it is unfit for the like uses again, until it has been exposed to the influence of the air. This is effected in the *lungs,* and is the ultimate design of *respiration*.

Thus constituted—with the instruments of motion, and the means of preserving and repairing itself—still does the machine require an active principle—a primum mobile—a spring that gives impulse to the whole, ere it can possess the power of self-operation. This alone resides in the brain and nervous system—the organ of sensation and motion; whose presence essentially distinguishes the animal from the vegetable. By the faculty of motion, animals are enabled to perform certain actions; by that of sensation, they obtain a knowledge of what is passing around them. The only sense that pervades almost all classes of animals, is that of feeling: the others,

which appear to be only modifications of it, in a more exalted and susceptible condition, are by no means connected with their vitality. The eye is so constructed that it can feel the rays of light; and the ear so formed as to take cognizance of the vibrations of sound; but on neither of these senses has life any dependance; for a blind horse is as much alive as one whose vision is perfect; and there are some animals in which sight and hearing are entirely wanting. Indeed, scarcely any parts of animals present greater varieties than the organs of sense: in the human subject, the power of feeling is inherent in an eminent degree in the tips of the fingers; in the horse, we find no proper organ of feeling—it is probably compensated for by the super-excellence of that of smell; and so exquisitely fine is this sense in the dog, that even the tracts of the light-footed deer are followed by him with a certitude truly surprising.

The term of life of every animal being fixed, at a more or less distant period according to its kind, it was necessary that it should be provided with means for the propagation of the species. Among the higher classes, generation is the effect of the concurrence of the sexes; each of which possesses an assemblage of organs, mutually adapted to this end: but in the lower orders, the sexes are now and then combined in the same individual; or generation is performed without any copulative act at all. In the male, the testicles separate a peculiar fluid from

the blood, known by the name of *semen*; and the chief use of the *penis* is to conduct this fluid into the *uterus* or *womb* of the female; in order to excite in the *ovum*, therein contained, a disposition to growth and developement. In one of two small glandular bodies, placed within the belly of the female, named the *ovaries*, is formed the *ovum*; whence, through a tube denominated the *oviduct*, it is transported into the womb: here the little *embryo*, exposed to the influence of the seminal fluid, gradually developes itself, acquiring the precise form and attributes of its parent; until the period of its consummation has arrived, when it is launched into the world to provide for itself.

VETERINARY LECTURES.

LECTURE I.

On the Blood.

ACCORDING to the course which we observe in the compilation of these lectures, the blood presents itself as the first subject of our consideration; and with real advantages to the student is it made so by our teachers of human anatomy, whose arguments in favor of this method are so instructive, that we cannot pass them over here entirely unnoticed.

The body is said to be composed of two orders of parts—*solids* and *fluids*. Of the latter the blood constitutes the chief bulk; indeed it may be regarded as the *matrix*, if we may be allowed the term, out of which all the others, as well as the solids themselves, are formed and re-produced. But the fluids of the body differ from the solids, inasmuch as they afford, from the uniformity of their properties, a composition of a more simple and intelligible kind—than is presented to us, by, perhaps, the least complicated of the latter; a fact that might of itself

induce us to treat of them in the beginning of the course. Another and obvious advantage, however, resulting from such an arrangement, is this: that in investigating the properties of the fluids, it is seldom or ever necessary to advert to the solids; whereas, if we were to reverse this order, we should find ourselves often much perplexed to render our descriptions intelligible, for want of an adequate knowledge of the former, and more particularly of the blood; so that, in fact, we may look upon a thorough acquaintance with the properties and uses of the blood, as, in a great measure, the ground-work of our future anatomical, as well as physiological acquirements. Moreover, regarding the blood, in an anatomical point of view, as constituting a part of the body, it must indubitably be considered as by far the most essential: at the same time, it has been so much submitted to observation and experiment, that we may safely say, none has received more splendid elucidations from the most celebrated writers on human medicine; and add, that few still present a wider field for future research. When we contemplate the names of a HARVEY, a HALLER, and a HUNTER, and reflect on the time and labor these eminent physiologists bestowed on their investigations, relative to the nature, the uses, and the motion of this fluid, we shall be still further convinced of the importance of our present subject, and regard it as one having additional claims to our primary and profound consideration.

Blood may be defined to be, a fluid circulating within the heart, arteries, and veins of a living animal. From the uniformity of its appearance, it has received the name of an *homogeneous* fluid; and such indeed it appears to be, while circulating within its vessels in the living body: the lapse of a few minutes, however, after its

detraction, presents to us a mass composed of dissimilar parts, or one of an *heterogeneous* nature.

The color of the blood is red in all warm-blooded animals; though it is said to vary in its shades of redness in different classes of them*. Of its doing so in different parts of the same animal, we have full and familiar demonstration: in the common domestic fowl, for example, some parts—as the wings and breast, are white; others—as the legs, of a faint and dusky red hue; while the heart, liver, &c. present all the common appearances that the same organs do in quadrupeds. On the other hand, many animals, called cold-blooded, possess blood entirely colorless: *e.g.* in the insect tribe, it is thin, limpid, and transparent. Again, there are others in which a red blood circulates in those parts more immediately connected with life: such are fish, whose vital organs are red, though their muscles are perfectly white. Without further digression, however, to prove that color is not an essential property of blood, we may advert to some parts of the horse, which are wholly supplied with this fluid in a colorless form: the transparent parts of the eye are a familiar example of this, in which the vessels are too minute to admit of the entrance of the coloring particles. On the contrary, blood in some parts of the body is so intensely red, that its color approaches more to that of the Modena red, or purple—as is the case with that contained in the pulmonary arteries, and venous system in general; while in others, its hue is of the brightest scarlet—of which the pulmonary veins and larger ar-

* The blood of the horse is not so red, under ordinary circumstances, as that of the human subject; nor is that of the latter so high colored as that of the dog, so far as we have compared them.

teries afford the best examples. To the dark-colored portion, the name of *venous blood* has been applied; to the bright red, that of *arterial:* it will be seen, however, from what has been before stated, that these epithets are not in strict conformity to the laws of the animal economy. The shade of red, then, not only varies in the blood of different species of animals, but in that of the same animal, from the darkest Modena, or purple hue, to a perfectly limpid brightness. With the exception of that flowing within the pulmonary vessels, the blood changes its color, from the bright scarlet, or arterial hue, to the dark red, or venous, in passing from arteries to veins—a change, the intensity of which depends on the rapidity with which it circulates from one set of vessels to the other; so that, as might be expected, stagnation in any part will have a similar effect on it. Rest, therefore, or what is, in a measure, equivalent to it, tardiness of motion, will be attended with an alteration in the appearance of this fluid. If, for example, you tie a cord around your arm, that part more remote from the heart, will become turgid, from distention of its vessels with blood; which (blood) will rapidly undergo a change, from a more or less bright red, first to a Modena, and ultimately to a dark purple, or black hue—changes solely referable to its detention by the ligature. Under extraordinary rapidity of circulation, the result, though not altogether the converse of the former, is still very different, inasmuch as the arterial character is preserved by the blood in its course through the veins; and this appearance will be in pretty exact ratio to that of its augmented celerity. The common operation of venesection affords a good illustration of this: when you first open the jugular vein, the blood which spirts out, is of a dark venous hue, but in a short

time, the stream assumes a reddish tint, and often, particularly when the orifice in the vein is large, becomes quite of the arterial character; a change simply owing to its quicker circulation from artery to vein, and its consequent accelerated flow in that vessel from which you are drawing it. Having before stated, that the converse of what generally takes place, happens in the pulmonary vessels, with regard to the color of the blood, it will here be necessary briefly to explain this phenomenon: let us, however, remark by the way, that in no part of the body is the contrast greater between the two kinds of blood, than in these tubes. In the pulmonary arteries, its color is so dark, that it has not unfrequently been called by authors, *black blood,* though it is, in truth, only of the most intense Modena red; while, on the contrary, in the pulmonary veins, nothing can exceed its beautifully bright red, or scarlet tint. Now, as the pulmonary arteries convey the blood to the lungs, and the pulmonary veins return it from them, it is evident that this remarkable and sudden change must have been effected in those organs: physiology has demonstrated that it is so, and that it is to be ascribed to the air which they contain, and, farther, that it is a process essential to the support of the animal's life. Venous blood is unfit for the various purposes to which arterial is applied; it is, consequently, sent through the lungs in order to acquire renovated properties; and these are made manifest to the eye of the anatomist, in the alteration of color.

In the more perfect, or, as they have been denominated in contradistinction to the others, the warm-blooded animals, the blood is every where found, while circulating in the living body, to be of a certain degree of heat; and this it steadily preserves in its circulation through the inward

parts of the body, uninfluenced by the surrounding temperature*. In all unexposed parts, the heat will exceed 100° of Farenheit's thermometer; it has been found however, by experiment, that this degree is not equally maintained in the more superficial situations of the body: what these variations are, we have but little to do with; though they may be ascertained by the aid of the thermometer, at any time, with precision. But in the lower orders of animals, or such as are called cold-blooded, the heat of the blood corresponds with that of the medium in which they live. We are not, however, to suppose that the temperature of this fluid is never subject to variation, even in perfect animals, for it is found to be much influenced in them by disease: *e.g.* in the human subject, in whom the heat of the body is, in health, 98°, it has been known to rise to 110° during fever; and in all superficial parts, increased heat is one of the essential symptoms of inflammation.

The weight of a given quantity of blood when compared with a like volume of water, is nearly one-eleventh more—*i.e.* water being equal to 1000, blood is about 1090; but its specific gravity will be subject to variation, according to the state of health of the animal from which it is taken: it will be greatest in such as are the strongest, and enjoy the most perfect health.

* The heat of the horse's blood, while flowing into a basin, is 100°. If the bulb of the thermometer be introduced into the wound, the quicksilver will rise to about 101°. The temperature of the more superficial parts of the body will, in course, vary with that of the surrounding atmosphere. Mr. Hunter found, that the thermometer introduced into a wound two inches deep, made into the gluteal muscles of an ass, indicated 100°; and that the heat of the vagina was the same. The interior of the chest of the dog, he ascertained to be 101°.

For many reasons, it is impossible to form a correct estimate of the quantity of blood contained in an animal; though, at first view, it appears no difficult task to arrive at such a knowledge. We have no means, however, of extracting the whole of this fluid from the body, or of correctly ascertaining what remains in it after death; and though the following experiment may answer every practical and useful end, still it is by no means conclusive as a nice computation: it is one that has been frequently made on the dog, in this instance we repeated it on an ass about six months' old.

The weight of the animal being ascertained to be 79lbs. a puncture was made with a lancet into the jugular vein, from which the blood, which flowed in a very free stream, was collected. The vein having ceased to bleed, the carotid artery of the same side was divided, but no blood came from it: in a few seconds afterwards the animal was dead. The weight of the carcase was now found to be $73\frac{1}{2}$ lbs. consequently it had sustained a loss of $5\frac{1}{2}$lbs. precisely the measure of the blood drawn. It appears from this experiment, that an animal will lose about 1-15th part of its weight of blood before it dies; though a less quantity may so far debilitate the vital powers, as to be, though less suddenly, equally fatal. In the human subject, the quantity of blood has been computed at about 1-8th part of the weight of the body; and as such an opinion has been broached from the results of experiments on quadrupeds, we may fairly take that to be about the proportion of it in the horse: so that, if we estimate the weight of a common sized horse at about 12 cwt. the whole quantity of blood will amount to 84 qrts. or 168 lbs. of which about 45 qrts. or 90 lbs. will commonly flow from the jugular vein prior to death; though the loss of

a much less quantity will deprive the animal of life*. It is well known, that young animals possess more blood than old, and that they will, perhaps on this account, sustain greater bodily injuries, and bear larger hemorrhages; indeed they are wisely provided with such an excess, if we may so term it, in order that their growth may be promoted, and their several organs maintained in a state of vigour: but in old, in which the body is gradually decaying, and the powers of life declining, the quantity of this fluid becomes reduced. Mr. Wilson, in his *Lectures on the Blood,* &c. says, that "Fat animals are found to possess less blood than leaner animals, and tame animals which are confined, less blood than wild ones."

Some have formed speculations on the quantity contained in the human body, from the losses occasionally sustained; vague, however, must ever be such conjectures; for it is found that blood to an enormous amount may be lost, in cases where hemorrhage, not copious or too long continued, returns at frequent intervals: thus in uterine and nasal hemorrhages in the human subject, astonishing accounts have been published of the

* Supposing a man to weigh 12 st. or 168 lbs. the quantity of blood contained in his body may be rated at 21 lbs. or 2 galls. 2 qrts. and 1 pint. Again, granting that a dog weighs 40 lbs. the amount of his blood will be five pints. These calculations are useful, and worth our retention, inasmuch as they serve to guide us in practice, as to the probable extent to which we may, with safety, carry venesection in different animals. For instance, we may reckon the loss of a pint from a man to be equivalent to that of a gallon from a horse, or to four ounces from a dog, and *vice versá;* selecting individuals from each class about the respective weights we have here set down.

total admeasurement of the collected daily discharges. But in all these cases, we are to remark, that it is the gradual or occasional loss of it, and, consequently, the time given for its reproduction, (for new blood is made even while the old is escaping,) that enables these patients to bear up against the debility ever attendant on such affections*. Animals, in fact, support losses of blood well or ill, according as the part, from which it comes, bleeds more or less freely, or as the hemorrhage endures for a longer or shorter space of time: on this principle it is, that a large orifice is in general to be preferred, in the detraction of blood for inflammatory disease, to a small one. There are some parts of an animal that contain more blood than others: *e.g.* muscle possesses more than either bone or tendon, and is, consequently, redder; as color in the living body is, for the most part, dependant on blood. Parts much exerted are found to have more blood sent to them than others, which, though of similar structure, are less used:

* "I have seen several quarts thrown up from the stomach in a few hours, even by a very thin puny person: and, on the other hand, if we had not this proof, we should suppose that there could be but very little, when a few ounces will make a person faint. I have an idea however that people can bear to lose more by the stomach than by any other way. Besides it becomes a matter of surprise how little is commonly found in the dead body: but I believe in disease it in some degree diminishes with the body, for more is to be found in those who die suddenly, or of acute diseases; and even in some who die of lingering diseases, as a dropsy, we have a considerable quantity of blood. The only way of accounting for this, is, that in a common lingering illness there is less blood, and in a dropsy it coagulates less; for the strong coagulation squeezes out the serum which I imagine transudes after death, and is not observable." *Hunter on the Blood.*

hence, the muscles of the legs of a fowl are red, but those of the wing and breast nearly white.

Blood, while circulating in its vessels, is always fluid; were it not perfectly so, the transmission of it through numerous capillary tubes to different parts of the body, could not be effected.

That blood is constantly kept in motion during life within its vessels, is an opinion that has been handed down to us by the earliest physiologists; but it was not until the time of HARVEY, that, what is now called, the *circulation of the blood* was discovered. HARVEY demonstrated, that this fluid, which previously to his time was believed only to ebb and flow, was conveyed by one set of tubes to every part of the body, called arteries; and by another, termed veins, returned to the heart, or source whence it came; that, thence, it performed a second revolution through the lungs, in order to be rendered fit for the various and important uses, it serves in its transmission over the body. So that, in truth, there may be said to be two circulations, the greater and the lesser: the former, meaning its course over the body in general; the latter, that through the lungs. Two of the best, and at once demonstrative proofs of the circulation, are the simple experiments of putting ligatures around an artery and a vein: in the one case, that portion of the vessel will be full of blood which is next to the heart, while the opposite part will remain empty; in the other, the reverse of this will happen; clearly demonstrating, that the blood is perpetually flowing in both sets of vessels, and, at the same time, shewing, that its current in each is in opposite directions.

The blood, though fluid while circulating, possesses a power of becoming solid—of converting itself into

a glutinous mass, called a *coagulum;* by which property, it is variously converted into materials for the growth, support, and repair, of every part of the body.—Bones, muscles, &c. are formed from it; the different organs of the body are kept in a continual state of tone by it; divided surfaces and fractured bones are glued together and repaired by it; and lastly, all the secretions of the body, as urine, bile, saliva, &c. are furnished by it: moreover, by this power of coagulation, when extravasated from its vessels, are many dangerous bleedings arrested, which might otherwise prove destructive to life.

To the indefatigable exertions of Mr. JOHN HUNTER, in the promotion of medical science, are we indebted for those opinions which attribute to this fluid, while circulating in the living body, a vital principle. In his dissertation on this subject, Mr. HUNTER prepares the mind for the reception of so novel, and, at first view, so inconceivable a doctrine, by the following preliminary notice: "To conceive that blood is endowed with life, while circulating, is perhaps carrying the imagination as far as it can go; but the difficulty arises merely from its being a fluid, the mind not being accustomed to the idea of a living fluid." And, at another place: "Our ideas of life have been so much connected with organic bodies, and principally those endowed with visible action, that it requires a new bend to the mind, to make it conceive that these circumstances are not inseparable. It is within these fifty years only, that the callus of bones has been allowed to be alive; but I shall endeavour to show, that organization and life do not depend in the least on each other; that organization may arise out of living parts and produce action, but that life can never rise out of, or depend on, organization." Mr. HUNTER then proceeds to

show, that the principle of life may and does exist in animal substances devoid of apparent organization and motion, in proof of which he instances the egg, as a familiar and striking illustration; which, he says, so long as it retains this principle, resists the influence of external agents—such as heat and cold, much longer than dead animal mat er. To support this fact, he made the following experiment: he put a new laid egg into 0 of Farenheit's thermometer, and froze it—with a view of destroying its preserving powers, and then allowed it to thaw. Next he put this egg, and another newly laid, into a cold mixture: the former was frozen seven minutes and a half before the latter. From this, and from other similar experiments, the author comes to this conclusion: "That a fresh egg has the power of resisting heat, cold, and putrefaction, in a degree equal to many of the more imperfect animals, which exhibit nearly the same phenomena under the same experiments; and it is more than probable that this power arises from the same principle in both."

In the next place, Mr. Hunter demonstrates, by some ingenious experiments, not widely different from those just mentioned, an analogy between the coagulation of the blood and the contraction of muscle detached from the body.

He reconciles the repugnant idea of life in a fluid always in motion, and often separated into many portions, by saying, that all its parts are similar, and in perfect harmony with each other. "Because blood is alive," continues he, "it has the power of preserving its fluidity; were it not so, it would be, in respect to the body, as an extraneous substance. Blood is not only alive in itself, but is the support of life in every part of the body; for

mortification immediately follows, when the circulation is cut off from any part."

"Moreover," he says, "blood itself must be kept alive; because, while it is supporting the life of the solids, it is either losing its own, or is rendered incapable of supporting that of the body. To accomplish all this, it must have motion, and that in a circle, as it is a continuance of the same blood which circulates, in which circle it is in one view supersaturated, as it were, with living powers, and in another is deficient, having parted with them while it visited the different parts of the body."

Mr. HUNTER also shows a striking coincidence between the coagulation of the blood and the contraction of the muscles, a phenomenon we know to depend on life, and one that he considers as the strongest proof of the existence of the vital principle.

Animals killed by lightning, or by electricity, have not their blood coagulated, nor their muscles contracted. Those that are hunted to death, exhibit the same appearances. In persons who die suddenly—as from blows on the stomach, or sudden gusts of passion, this strict observer remarked the same coincidence. "The natural deduction from all these facts and observations," says he, "I think is perfectly easy; it is impossible to miss it."

Presuming from these *data*, that the blood, in common with the solid parts, is possessed of what he calls the *materia vitæ diffusa*, Mr. HUNTER now enters into an inquiry of some length and ambiguity, through which we have neither time nor inclination to follow him, relative to the nature and disposal of this *materia vitæ;* in the course of which he says, adverting to where the living principle of the blood first begins, "I am rather inclined

to think that the chyle itself is alive; for we find it coagulates when extravasated; it has the same powers of separation with the blood; and it acquires its power of action in the lungs, as the venal blood does."

This is a short but imperfect sketch of Mr. HUNTER's opinions concerning the life of the blood: to say the least of them, they are extremely ingenious, and are the products of much cautious and laborious investigation, and, we must admit, as the offspring of so great a mind, well deserve our serious consideration.

LECTURE II.

On the Blood.

HAVING treated of this fluid, in our last lecture, as circulating in the body; we shall, in this, examine its properties when taken out.

When blood is first received into a vessel, a *halitus*, or vapor, emitted from its surface, is observable: a mirror held over the basin becomes obscured by it, and a peculiar odor accompanies its fumes, which is said to be more unpleasant in carnivorous than in graminivorous animals.

We observed, in the last lecture, that blood, although apparently, was not in reality, an homogeneous fluid; for when drawn and allowed to remain at rest, it separates into two parts: a red solid portion, called *crassamentum*; and a yellowish fluid part, called *serum*.

This spontaneous separation of its component parts, is called its coagulation: it takes place, in the blood of the horse, in the space of about twenty-five minutes; in that of the human subject, in seven or eight.

These two parts differ in their relative quantities in different animals, and in the same animal at different times, depending on the state of the general health of the

subject from which the blood is taken: in some diseases, and in weak subjects, the proportion of serum is considerably augmented. Richerand, in his *Elements of Physiology*, says, that "in the human subject, the serum constitutes about one-half, or three-fourths of the fluid; the coloring matter and fibrina are in inverse ratio of the serum; and it is observed, that the more brilliant and red the color of the blood, the greater the proportion of the fibrous parts." In the healthy horse, the serum may be computed at about one-half of the whole quantity of the blood taken away.

On the Serum.

Serum is a fluid of a deep yellow, or straw color, having the appearance of being about the consistence of water; it is heavier, however, than that fluid, though the thinnest part of the blood, in consequence of its possessing some degree of tenacity.

Though the serum be naturally of a deep yellow, its color is subject to some variation in disease. In the human subject, this has been frequently taken notice of in jaundiced persons, in whom it acquires a brown tinge from the admixture of bile; and in the horse, in which jaundice is comparatively an uncommon disease, we have remarked the same appearance.

It has been asserted, that the proportion of serum, in a given quantity of blood, constitutes one of the most material differences between the composition of this fluid in the horse and of that in the human subject: in the one, soon after it has been drawn, we discover the coagulum swimming in serum; while the other consists of one uniform congealed mass, whose surface is scarcely moistened by serous exudation. In order to form a correct esti-

mate, however, of the proportion of serum in a given quantity of blood, it will be necessary to keep the mass for several days, and this we can commonly do without its becoming putrid; whereas the blood of the human subject will putrefy in the course of two days after it has been drawn, even at the temperature of 50°: a want of such precaution has created much erroneous statement on this subject.

If we draw a pint of blood from a horse in apparent health, serum in the following quantities, at the intervals stated, will be separated. During the first five or six hours, very sparing exudation takes place; but soon afterwards, the coagulum becomes surrounded by it; so that next day, twenty-four hours from its detraction, we may commonly pour off from five to six ounces. After this, its proportion daily becomes less: from one to two ounces are found in the vessel on the second day, from half an ounce to an ounce on the third, from three to five drachms on the fourth, about one drachm on the fifth, and a like quantity on the sixth; and on the seventh day generally, at the temperature of 50°, the mass is putrid. Now, if we sum up the media of these several quantities, we shall find that the serum amounts to rather more than half of the whole quantity of blood drawn; we may fairly take, however, *half** as the average.

It appears therefore, that the most essential differences between our blood and that of the horse, are—first, that the latter possesses greater preservative powers against putrescency than the former, when extracted from the body; and secondly, that the spontaneous separation of

* "Le serum est un liquide aqueux, transparent, *roussâtre*, et d'une saveur salée, et dont la proportion la plus ordinaire est *d'un tiers à la moitié.*" *Traité d'Anatomie Veterinaire*, par Girard.

it, into its elementary or component parts, requires a longer space of time: it is not true, that there actually exists any very marked difference between them in regard to the relative proportion of serum.

If serum be exposed to 160° of Farenheit's thermometer, it will be converted into a solid tremulous mass, the effect of coagulation; in which state, a little fluid oozes out from its sides, termed the serocity: the admixture of boiling water, of some of the mineral acids, or of alcohol, also coagulates it. The coagulum of serum is similar in its properties to common white of egg, or, what is called, *albumen:* its serocity has been found by Dr. Bostock, (in his *Analysis of Human Blood,*) to consist of common mucus in conjunction with soda and some neutral salts.

Serum, or a fluid very like it, is occasionally separated from the blood in large quantities within the different cavities of the body, constituting that disease known by the name of dropsy. Serum is supposed to be the *menstruum,* or solvent of all the secretions.

The *crassamentum,* or *cruor,* is composed of two parts:—the *red globules* and the *coagulable lymph:* to the former the blood owes its color; to the latter, its solidity and firmness.

On the Red Globules.

The red globules, or red particles, as they have been also called, constitute the coloring ingredient of the blood: they are commonly entangled in the coagulable lymph during its coagulation, though occasionally some are mingled with the serum, tingeing it red. They form, probably, the least important part of the blood; for in some animals, many organs of the body are supplied with this

fluid without globules: *e. g.* in most fish the muscles have no red blood, and in the common domestic fowl we know that the muscles of the wings and breast are commonly white. In the human subject, and in the horse, there are also some parts that are supplied only with thin colorless blood, the best example of which is (as we mentioned in the former lecture) the more transparent parts of the eye, where the blood-vessels are too minute, in a state of health, to admit of the passage of red globules; though, under certain morbid affections, they become augmented in size, and then readily allow of the circulation of the coloring particles: hence these parts, which were before colorless and transparent, are now obscured and filled with red blood. In some animals this fluid is altogether without the red globules: none has been found in the blood of insects.

It is to microscopical observations that we owe what speculations have been offered in regard to the size and shape of these minute bodies; we say *speculations*, for, as yet, authors have not come to any determinate conclusions on this subject. From the extreme diversity of opinion of those who have endeavoured to ascertain the dimensions of a globule of human blood—one estimating it at $\frac{1}{25000}$ part of a grain of sand, while another computes it at $\frac{1}{5000}$ part of an inch, it is evident that much illusion has ever attended these inquiries. It appears nevertheless well authenticated, that their size is not at all in proportion to the bulk of the animal; for their dimensions vary but little either in the ox, ass, cat, or mouse*; and in the skate it is generally believed that they are larger than in any other animal.

No less discrepant have been the descriptions of au-

* Vide Wilson's *Lectures on the Blood*, &c.

thors as to their shape: some have compared them to rings, others to flattened vesicles, &c. the opinion best received at the present day, is, that they are spherical; but, from being possessed of flexibility, occasionally undergo some alteration in form, during their progress through the smaller blood-vessels of the body.

Though red when viewed in the general mass of blood, the globules seen in small clusters, or individually, are yellow, or transparent. In order to explain the cause of these different shades, nothing more is requisite than to detach a drop, or two, of port wine within a glass capillary tube, or of any other dark colored fluid, and it will be found, if held to the light, to be perfectly limpid and colorless; or, if there be more than one, of a lighter and altogether different shade from that of the fluid from which they were taken: it is from this cause, then, that the blood, when distributed in the minute blood-vessels, is of a different hue from that in the trunks. The color of the globules is affected by atmospheric air: if you examine a clot of blood in a blood-basin, you find its upper surface, which has been exposed to the air, of a bright scarlet hue, while the under, or that which has lain in contact with the basin, is of a dark Modena red, or purple; but invert the coagulum, and the one will become dark by exclusion from the air, while that which was before purple, will acquire a scarlet hue from its influence. In order to prove that this change is effected by the air, if you place dark colored, or venous blood *in vacuo*, its color will remain unaltered. To the same cause is ascribable that change of color which this fluid receives in the the lungs of the living animal.

The red globules appear to be the most difficultly formed of any part of the blood; so that a person who

has lost much blood from hemorrhage, looks pale for some considerable time afterwards; hence it is also, that butchers render their veal white, and delicate in appearance, by repeatedly bleeding calves while they are fattening.

The quantity of these particles varies in different animals, and in different parts of the same animal. Those appear to have most that are in the best health, and perform the utmost labor compatible with their strength; but in all, they abound in the different glands of the body, are more numerous in muscles than in sinews, or bones, and especially in those most exerted, which are consequently the reddest.

We have before observed, that the globules do not appear to be equally essential with the other constituents of the blood: their precise use is not known.

On the Coagulable Lymph.

The coagulable lymph, sometimes described under the names of *fibrine*, or *fibrina*, and *gluten*, is that part to which the crassamentum owes its chief bulk, solidity, and firmness; and is of greater importance in the animal economy than either of the others. During the circulation of the blood it is perfectly fluid, and is so intermixed with the serum and red globules, that we have no means of separating it.

When freed from the red globules and serum, by washing, maceration, &c. it is nearly white, or colorless.

The coagulable lymph is a firm, tough, and elastic substance, of greater specific gravity than serum, exhibiting a fibrous texture very analogous to that of muscular fibre, hence its name of *fibrine*, or *fibrina*.

Its toughness, which is often extreme, is not apparent

till some time after its coagulation; for we have found, that a coagulum will contract, or become smaller by squeezing out serum, even for a week, or more, after the blood has been drawn.

We have before stated, that the blood soon coagulates of its own accord, when taken from the body; we shall now briefly point out how its coagulation is affected by various external agents. It will coagulate sooner when drawn from a small orifice, or allowed to trickle down the neck, or if it be collected in a vessel with a broad extended surface, or in one of a triangular form; but if it be drawn from a large orifice, in a free stream, or be collected in a deep narrow vessel, its coagulation will be retarded. Heat, above 125° of Farenheit, acids, alcohol, and alum suddenly coagulate it; and it will concrete sooner in the natural heat of the body than in any degree below it. Neutral salts altogether prevent its coagulation. Keeping the blood in motion, during its detraction, does not delay its coagulation; and if it be kept stirred, while fluid, with a wisp, the coagulum will assume a distinct fibrous appearance. Blood that has been frozen will not congeal.

When the coagulation of the blood is from any cause retarded, the red particles, being the heaviest part, gravitate to the bottom of the blood-basin; and, instead of being entangled uniformly in the substance of the coagulum, collect chiefly in its lower part; leaving the surface, and a portion below it, entirely without them, which, from the serum it contains, exhibits a yellow appearance: to this part the name of *buff*, or *size*, has been given. This state of the coagulum may frequently be prognosticated, by touching the surface of the blood, a few seconds after it has been drawn, with the finger: if no

red particles adhere to it, but it be moist with a yellowish and perfectly limpid fluid, you may safely predict that the coagulum will be buffy.

Blood coagulates in the body after death; though not always; for in cases of sudden death, as in horses that die suddenly from hunting, or racing, or in hares that have been coursed to death, it remains fluid.

The constituents of the coagulable lymph, are fibrine or gluten, and albumen.

Various attempts have been made to discover the cause of the spontaneous coagulation of the blood: the following are those that have been commonly assigned for it. Cold, from the change of temperature which the blood undergoes when drawn, was said to be one; if, however, it be received in the same degree of heat, to which it was exposed while circulating in the body, its concretion (far from being prevented, or even retarded) will be accelerated. Rest was said to be the cause of it; but, as we have before stated, it will coagulate though it be constantly stirred, or otherwise kept in motion. Exposure to the air has been thought to account for it; and, certainly, the process appears to be in some measure assisted by it, although it is by no means the principal agent; for blood will congeal even *in vacuo*, though it requires a longer space of time.

We concluded our former lecture with some remarks in illustration of the doctrine of Mr. John Hunter, in regard to the principle of life being inherent in the blood: to this cause the same eminent physiologist attributed the coagulation of it. We then briefly stated, that, among other ingenious illustrations, this author remarked the close analogy existing between the coagulation of the blood and the contractions of muscles; which

with fifty or a hundred times its weight of healthy pus, would convey the disease by inoculation with a fiftieth or hundredth part of such a mixture. In further illustration of this, we can, and do medically, not only without any baneful effect, but with manifest advantage, take minute quantities of substances of so poisonous a nature, that the old practitioners were altogether deterred from the use of them. This subject, however, has of late been put without the pale of disputation by actual experiment. Some years ago, at the Veterinary College, the blood of a horse affected with glanders (which is a contagious disease, and one at all times readily communicable by inoculation) was transfused into the veins of a healthy ass, previously prepared by copious blood-letting: in the usual space of time, the animal exhibited every symptom characteristic of glanders, of which it shortly died. Considering the antiquity of the practice of transfusing blood, from the vessels of one animal into those of another, it is somewhat remarkable, that this fact has never been before demonstrated by experiment; for it is now nearly two centuries ago, since this operation was first attempted on dogs, and subsequently on men, with expectations of the most glittering description: like those who were so solicitous about transplantation of teeth, however, the individuals on whom it was practised, were occasionally seized with diseases of a malignant and dangerous tendency.

The blood not unfrequently, in the human subject, exhibits, what are considered as, morbid appearances: whether this be the effect of what Mr. HUNTER calls "contiguous sympathy—a real increase of animal life"—or, whether it arise from some variation in the relative proportions of its constituent parts, or be produced by some morbific matter contained in it, we are not about to

inquire. All we wish to impress here is, that, what is regarded as indicative of increased, if not diseased action in the vascular system of the human subject, is perfectly natural to that of the horse, in his domesticated state: if, therefore, you examine the blood of a horse in apparent good health, you expect to find it *sizy*. It has been, with great truth, remarked, by some of our best practitioners in human medicine, that an inflammatory *diathesis* is by no means essential to the production of buffy blood: an opinion confirmed by the appearances of horses' blood in health. We do not believe that this fact is universally known—we have searched the works of veterinary authors on the subject, with but little advantage; for they have either transcribed their accounts, which are for the most part erroneous, one from another, or borrowed them from human anatomy.

Blood is said to be *cupped*, when the upper surface of the coagulum, instead of being perfectly even, is concave, as if it had been scooped out, and the surrounding margin is elevated, and more or less inverted. This appearance in human blood, is commonly regarded as a mark of inflammatory action, and one that, in combination with certain febrile symptoms, imperiously calls for a repetition of blood-letting. But in that of the horse, it has been asserted, nothing of the kind ever takes place. In order to show, that, so far from this opinion being a correct one, cupped blood is by no means unfrequently met with in veterinary practice, and that it is occasionally seen in health*, (as often we believe as in disease,) as well as to

* We had a remarkable instance of this, while engaged in some experiments connected with this subject. A horse, to every appearance in perfect health, was bled to one pound; after which he was galloped (for the space of about twenty minutes) until he

point out the space of time in which healthy blood coagulates, and the average proportion of serum contained in it, we have subjoined the following statement:—

sweated profusely: while under extreme agitation, from the exertions he had been put to, another pint of blood was drawn, by unpinning the same orifice. The coagulum of the first parcel of blood was sizy, tough, contracted, and deeply cupped: that of the last exhibited no signs whatever of buff, was extremely loose and flabby in its texture, so that on being handled it readily mingled with the serum; and in a much shorter time than the first, went into the putrefactive state.

This latter fact is intimately connected with what we have already advanced, regarding the non-coagulation of the blood after an animal has been coursed to death; since, had exertion been continued until the horse sunk under it, the blood would probably have remained wholly fluid; whereas, in this case, the animal being only in progress towards that state—being only urged to a point from which he could recover, the coagulating powers of the blood were merely diminished.

STATEMENT.

Horses (in health) bled, with the state of pulse.	Under what circumstances.	Quantity of blood drawn.	Space of time in which it flowed.	A film of coagulum perceptible upon its surface.	Firmly coagulated.	Appearances of the coagulum.	Quantity of serum separated prior to putrefaction.
12, whose pulses ranged between 40 and 50.	In stables under ordinary management.	lb.j.	From ½ to 1 minute	In about 10 minutes.	In about 25 minutes.	All the coagula showed buff about ½ inch deep; 7 of them were very firm, in 5 of which the surrounding edge was elevated and turned in: the other two were cupped. In 2 of the others the coagula were soft and flabby.	About one half of the whole quantity of blood drawn.

On Venesection.

One of the most powerful and efficacious means we possess of subduing disease, is venesection, phlebotomy, or blood-letting. There is no remedy quicker in its operation, nor any more beneficial in its influence, when properly employed; at the same time, there are few more pernicious than it in the hands of rash and unscientific practitioners.

We have two objects in view in taking away blood: first, that of diminishing the *momentum* of the circulation; and secondly, that of allaying the irritability of the nervous system. Though we can at all times fulfil the former indication, we do not so certainly effect the latter, by lessening the quantity of blood in the system; for in some cases, the frequency of the pulse, which is dependant on nervous irritability, will remain undiminished after the removal of as much blood as the powers of the constitution can withstand.

After having drawn blood for any inflammatory affection, there are certain signs, which may be pretty generally relied on, that indicate the necessity of a repetition of the operation; among the chief of which are, the unabated hardness, and strength, combined with frequency of the pulse and the continuance of pain, or the symptoms of it, in the part affected: the sizy or cupped state of the blood, combined with inordinate toughness of the coagulum, and a sparing exudation of serum, are also commonly believed to confirm this indication; from what we have advanced, however, in regard to these occurrences, it may fairly be questioned how far they are signs of disordered action.

In drawing blood it is advisable—nay, sometimes indis-

pensable, if we wish to give speedy relief, to make a large orifice in the vein, or artery, we may select for the purpose: by attending to this, we shall not only often arrest disease on a sudden, but absolutely prevent subsequent weakness, by having occasion to take less away, in the aggregate, during its progress. Dr. PEMBERTON, in his very useful *Practical Treatise on Various Diseases of the Abdominal Viscera of the Human Subject*, observes, in speaking of acute hepatitis,—"I find from numerous experiments made at my desire for this purpose by different surgeons, that when the orifice is such as to admit of eight ounces of blood to flow in three minutes, that then *a patient under acute inflammation will receive every benefit which is expected from the remedy*. If it flows in a longer time *he will receive less benefit*, and under certain circumstances *no benefit at all*, or even *absolute injury*."

LECTURE III.

On the Arteries.

OF blood-vessels there are two orders:—arteries and veins; we shall make the first the subject of the present lecture.

The arteries are elastic tubes, formed for the purpose of conveying blood from the heart to every part of the body. These vessels were formerly supposed to contain and distribute air over the animal system, hence the name of *artery;* an opinion that appears to have originated from the circumstance of their being found empty after death.

There are only two arterial trunks, from which all the branches of the body spring: these arise from the heart, and have received the names of aorta, and pulmonary artery: the first, by means of innumerable ramifications, transmits blood over the body generally; the last only conveys it to the lungs.

Arteries have been divided into *sanguineous,* and *lymphatic* or *seriferous:* those in which red blood ordinarily circulates, compose the first class; their minute ramifications, which are too small to admit the red globules, the second.

The ventricles of the heart are the sources from which all the arteries in the body have their origin, by means of the two trunks before mentioned.

Generally speaking, these tubes take the nearest course to the organs they are destined to supply. They are commmonly deeply seated, and run on the inner sides of the limbs rather than the outer, for the purpose of being better protected from external injury: in passing over a joint, they are most commonly found upon its bending side, by which precaution any preternatural extension of them in the motion of the part, and consequent obstruction to the circulation, are guarded against; and for the same reason, those of the lips, ears, and nostrils, take a serpentine course. There are some arteries whose canals are extremely tortuous, in which it is thought the circulation is, by that means, retarded: in this number may be reckoned those of the brain, testicle, and uterus; there are probably other reasons, however, for such a peculiarity of course in the blood-vessels of these parts, with which we are not at present acquainted.

The ramifications of the arteries may be compared to the branches of trees, of which the aorta and pulmonary artery form the trunks; their various subdivisions, the branches. For the vessels into which they divide, like the trunks themselves, send off others of less diameter; and these again, in their turn, become trunks to more minute ramifications; until, by repeated subdivision, tubes of infinite number and extreme exility, are distributed over every part of the body.

We find that arteries send off their branches in a somewhat different manner, according to their proximity to the heart, or source whence they receive their blood: *e.g.* some, in the immediate vicinity of that organ, are

coming off at obtuse angles—as is the case with the posterior cervical arteries; though most of them are leaving their trunks at right angles—of which the intercostals are ready examples; such, however, as are farther removed from the heart, arise at acute angles, as is abundantly exemplified in those of the extremities. The same hydraulic laws, which regulate the motion of fluids through tubes similarly arranged out of the body, must be adverted to here, in order to explain the advantages derived from this mode of ramification in arteries. If we were to impel water into a tube of any kind, with which many others communicated at different angles, we should find that the fluid ran with more facility into such as took the same course with the trunk, than into others whose junction formed a right angle with it; but found its passage with difficulty into those branches running in an opposite direction from it. Thus it is with the arterial system, through which the blood is propelled by the heart to every part of the body: in order to equallize the force of the circulation within the different ramifications, we find that those branches nearest to the heart, or pump, resist its too powerful action by being connected with the main trunk at obtuse angles; while those remotely situated from it, favor the influx of blood, and thus, in some measure, compensate for the diminution of propulsive power, rendered weak in them by their distance from the heart. Notwithstanding this admirable contrivance, however, to abate the force of the circulation in those vessels connected with the larger trunks, it does not appear that the design is wholly fulfilled; for surgeons in operating, on the human subject, on parts which receive their vessels immediately from the large arteries, are always particularly careful to arrest he-

morrhage; on which account, they often tie branches in the neck, which they would altogether disregard in the extremities.

When the trunk of an artery splits into two, or, as we anatomically express it, bifurcates, the conjoined area of its divisions is greater than that of the trunk itself; from which fact, anatomists, of late, have compared their cavities, taken in the aggregate, in form to a cone—regarding the capillaries as the base, and the aorta as the apex of it: but if we take any branch singly, we shall perceive that its form is also conical; in this case, however, the position of the cone is reversed—the origin of the vessel being the basis, its termination the apex.

The smallest arterial ramifications, which, from their extreme minuteness, have been termed *capillaries*, are so numerous that you can scarcely insert a pin into any part of the body without wounding one or more of them. Some structures possess a much more abundant supply of blood than others; of course their blood-vessels must be proportionately more numerous; hence, they are said to be more *vascular:* glands, which are secreting organs, are of this class; muscles also possess considerable vascularity, in comparison with sinews, or cartilage.

Arteries are said to have five modes of termination. The first, and most common, is in veins. An artery having become of so small size as to acquire the name of capillary, is reflected, and ends by continuity of canal in a vein, the commencement of which is equally minute; so that the distinction between the two at the point of union is lost. Common injections furnish us with abundance of proofs of this mode of ending: every one knows, who has been in the habit of injecting feet, that it is no uncommon circumstance for the waxen composition,

which is thrown into the pastern arteries, to return by the pastern veins; the same thing frequently happens in the testicle and head—indeed, in the course of dissection, we meet with numerous instances of it.

The second termination is that by *anastomosis:* when minute arterial branches meet and conjoin their canals, they are said to *inosculate,* or *anastomose.* The coats of the intestines well injected, present a surface of beautiful vascular network, in consequence of the very frequent inosculation of their smaller arterial branches: anastomosis, however, is not wholly confined to the terminations of arteries, for we have, in the foot, several communicating arterial canals of large size. The great advantage derivable from anastomosis, is, that of preventing the possibility of the supply of blood being cut off from any part, in case of obstruction in the trunks going to it; for, it is evident, that the larger arteries, although they do not immediately communicate, must, under such circumstances, still receive blood, by a retrogade circulation, from the inosculating ramifications. Pressure being one of the most frequent causes of obstruction, we discover at once, why the arteries of the foot should have been so liberally provided with anastomosing branches.

Notwithstanding the inosculation of arteries must have been known soon after the discovery of the art of injecting, it is not till of late years that surgeons have found out its importance as connected with operative surgery: the old practitioners were afraid of obstructing the cavity of one of these vessels, (by ligature,) lest mortification of the part, which it supplied with blood, might ensue; now-a-days, however, no such apprehensions are entertained in regard to, we may say, any part of the body. We have tied the posterior aorta of the dog, and many of the

larger trunks in the horse and ass, without the least apparent inconvenience being sustained by those animals. In one of the anatomical schools at Paris, a human subject was brought for dissection, in which the descending aorta was obliterated, but the circulation had been sufficiently well carried on by anastomosing branches; and Sir A. Cooper has lately published the case of a man who had an aneurism of the iliac artery, in whom he tied this vessel a little above its bifurcation: a memorable instance of the vast importance now attached to arterial anastomosis.

The third termination of arteries is in open mouths—upon, generally, extended surfaces. The smallest visible branches of arteries are found to be extremely short; and though we cannot trace them to their ultimate extremities, yet are we warranted in asserting, that they end in this way, from many facts and observations connected with the economy of the animal in health and disease. These extreme ramifications have been denominated *exhalents,* from the particular office they perform, *viz.* that of pouring forth the finer parts of the blood in the form of vapor: what is called the insensible perspiration, from the skin, is a secretion of this kind; as are all those serous fluids, emitted upon the membranous surfaces of the larger cavities of the body—the abdomen, thorax, &c. The numerous ramifications employed in the formation and repair of different parts of the body, are also probably of this description; and we believe, that the materials of which an animal is composed, are spewed forth from their minute orifices.

The fourth termination is in small cavities, called *cells,* of which some parts appear to be wholly made up: the spleen and penis are commonly believed to be of this

kind—in these organs the blood is poured into cells, from which veins arise that take it up again.

The fifth and last termination is in the beginning of a tube, called an *excretory duct :* these branches are denominated the *secreting,* or *secerning* arteries, in consequence of their having the power of separating something from the blood of a total different nature from that fluid itself; which secretion is conveyed by the excretory duct from the gland, as fast as it is formed within it by these vessels. The secerning tubes are so minute, that they can seldom be traced, even if injected, with much accuracy. In the liver, from their extreme exility and peculiarity of distribution, they have been called *penicilli :* probably they may be demonstrated better in the kidney than in any other gland; in the substance of which we can frequently trace them into small excretory vessels, called the *tubuli uriniferi.*

Most arteries are enveloped in a case of cellular membrane, by which they are connected to the surrounding parts; and in some places this substance is so condensed as to give them a complete covering, commonly called a *sheath*—as happens with the carotid arteries; it is, however, only an adventitious tegument, and is not to be regarded as one of its *proper* coverings.

An artery is composed of three *tunics,* or *coats,* connected together by cellular membrane, all of which possess a certain degree of elasticity: the *external* or *elastic,* the *muscular,* and the *internal, membranous,* or *cuticular* coat.

It is in the external covering of an artery that the property of elasticity essentially resides, hence is derived the appellation of *elastic* coat ; a property, which it not only possesses in the living, but preserves in the dead animal.

This covering is peculiar to arteries; so that any one at all conversant in anatomy, easily recognizes a vessel of this class, not only from its peculiar whiteness, but from the tubular form it preserves, even after its removal from the body. This coat is said to be made up of condensed cellular membrane, disposed in fibres which are seen running in every direction. It is much more abundant in the trunks than in the branches; hence arises the greater difficulty of distinguishing the latter from veins, they being comparatively loose and flaccid: in the aorta it seems to be more than equal in substance to both the other coats. Being elastic in the longitudinal, as well as lateral direction, an artery may be stretched either by elongation, or expansion, and it will still recover its original form and dimensions: in fact, the action of this coat may be said to be, that of tending to preserve the natural shape and size of the vessel. If an artery, in the living body, be divided, the first gush of blood will be immediately followed by the retraction of its cut extremities; and this recession of them into the surrounding cellular membrane often renders it exceedingly difficult to find them: this, aided by other means which we shall hereafter point out, becomes Nature's chief resource in the event of hemorrhage. Aware of this circumstance, surgeons, when called to a case of wound from which there is dangerous bleeding, always make it their primary enquiry, to ascertain whether the bleeding vessel be *completely* divided, or not: in the latter case, it is generally proper to cut the undivided portion, so as to give the extremities of the bleeding artery the power of retracting, and afterwards to employ pressure, before ligature of it be had recourse to. We have succeeded in stopping alarm-

ing hemorrhages from the internal pectoral, and submaxillary arteries of the horse in this way.

The second coat, placed immediately under the elastic, is called the *muscular*. In its composition it is fibrous; and its fibres are believed to be of the same nature, (for they appear to possess similar properties,) to those of the muscles themselves. They are best seen in the coats of the smaller arteries, which are thicker, in proportion to their calibre, than those of the large: these afford, many of them, pretty distinct traces of fibres, taking a circular course, and putting on the appearance of muscularity. That they are of this nature, is a fact Mr. Hunter first attempted to establish by the test of experiment: having bled a horse to death, he found, that the area of these vessels was considerably diminished—the aorta had lost about 1-20th of its original breadth, while the radial artery was contracted to 1-half of its former diameter. The result of this experiment is perfectly consonant with what we have here advanced, and seems to confirm our observations from dissection, relative to the proportions of the elastic and muscular coats in the trunks and branches. Notwithstanding these facts, however, the existence of a muscular coat has been by some denied; who have maintained, that in the substance of an artery, which is entirely white, any thing like muscular fibre is indemonstrable: but we know that color is not essential to muscles, and that those that have it (for there are many colorless ones) obtain it only from the blood within them. We have, however, many proofs that arteries possess a power, which, from its effects, can be no other than muscular: among others, may be mentioned the fact, of their action being occasionally increased,

without any acceleration, or alteration, of the pulsations of the heart: *e.g.* if a portion of the skin be inflamed, or if a stimulant be applied to it, we know that a blush will quickly appear upon the surface, owing to an unusual determination of blood to that part. Now, it is evident, that the action of the impelling powers must be augmented in order to produce this unnatural flow of blood to the part; and yet, if we examine the pulse, we are unable to detect any change in the general circulation; consequently, it must be local—one confined to the vessels of the part itself; which would appear to be the result of a kind of voluntary, or muscular power: by such reasoning alone, can we explain the act of blushing in the human subject. We stated before, that these vessels are found empty after death: this affords us an additional argument in favor of their muscularity, otherwise they could not discharge their blood into the veins. There appears still to be some doubt among physiologists, whether the muscular coat be employed, or not, in the ordinary circulation.

The third coat, or lining of the artery, is the *membranous*, or, as it is sometimes improperly termed, the *cuticular*. It is thin, but very dense; possesses much strength, but less elasticity than either of the others: that it *is* elastic, however, is proved from the circumstance of its never being thrown into folds during the contracted state of the vessel. Its internal surface is uniform, smooth, and polished, to allow of the free circulation of the blood; while, from its density, it prevents exudation—an accident that never occurs in the living animal.

The coats of these vessels are possessed of vascularity; or, in other words, have arteries, veins, and, it is thought, absorbents, entering into their composition. Their arte-

ries, which are very small, are called *arteriæ arteriarum;* their veins, *venæ venarum:* the former arise from the neighbouring arteries—never from that which they supply. Absorbents, we believe, have never been seen entering their coats; though Mr. CRUICKSHANKS, in his *Anatomy of the Human Absorbents,* says, that he has seen the aorta, almost throughout its whole length, covered with them.

Arteries possess but little feeling. Many of the larger trunks indeed are surrounded with nervous filaments, and some, doubtlessly, penetrate their coats—of which the aorta and carotid arteries are instances: it appears, however, that the circulation will continue in vessels in which all sensibility is destroyed; were this not the case, paralytic parts could not support their life.

The only arteries having valves, are the aorta and pulmonary artery, and they only at their origins from the heart: we shall describe the formation and use of a valve, when on the veins.

LECTURE IV.

On the Physiology of Arteries.

IN our definition of an artery, we said, that it was an elastic tube formed to convey blood from the heart to every part of the body. That this is the passage of the blood, experiment, as well as ocular demonstration, have long removed beyond the sphere of doubt: if you put a ligature on an artery, the vessel becomes turgid between the heart and the obstructed portion, but empty beyond it; and if you examine through magnifying glasses the transparent web of a frog's foot, the circulation in it may be readily seen. Considering the circulation, then, as a physiological truth—a point no longer contestable, and knowing that the blood flows from the heart, through the arteries, to the different parts of the body, we are naturally led to enquire by what means its motion is effected. We are to look on the heart as the primary agent in the circulation: by its operation, which has been compared to that of a pump, blood is impelled into the channels of these vessels, to be by them conveyed and distributed over the system at large; whence it is returned to the

heart by another set of tubes—the *veins*. Though the principal cause of the blood's motion, however, is the beatings, or contractions of the heart, we are not to regard the arteries as the mere channels of its transmission —as, in fact, altogether passive: on the contrary, they contribute much to its current, and in what manner they do so, we shall now proceed to enquire.

In order to be perfectly intelligible in our discourse of the economy of these vessels, it will be necessary to revert to what we advanced in the last lecture, relative to their property of elasticity—which was found to reside principally in the external covering, as well as to that of muscularity—which we endeavoured to prove was possessed by some circular fibres, running between the outer and inner tunics. By the former, we stated, that the artery was preserved of a cylindrical form, and determinate dimensions; and by the latter, that it had the power of contracting its natural calibre: moreover, we observed, that the property of elasticity was not dependant on life; but that the peculiar nature of the muscular was such, that it owed its powers entirely to vitality. We mentioned also, that all arteries were branches of one of two trunks, which arose from the ventricles of the heart: and this, we repeat, is an organ by whose operation these vessels are supplied with blood. Having premised these *data*, we trust that the principal causes of the blood's motion through the arteries will be made sufficiently apparent.

Every artery in the body always contains a certain quantity of blood, by which its cavity is completely filled: not, however, that this quantity is invariably the same, for it varies at every momentary supply from the heart; but, by the action of the elastic and muscular coats, the

calibre of the vessel is constantly adapted to the contained blood. It is, therefore, with truth asserted, that *an artery is always full.* At every beat of the heart, a certain portion of blood is thrown into the aorta, and pulmonary artery; (no matter which we take by way of illustration, for they both receive it precisely at the same time, and in the same manner;) which, being already in a state of plenitude, now become stretched from distention. The diameter of the vessel being increased by distention of its parietes beyond their tone, the elastic coat—the use of which is to preserve it of its ordinary dimensions, immediately exerts its counteractive force, in order to restore it to its original calibre. The muscular coat also, whose contractions will be excited by extension of its fibres, is probably at this instant called into action. What is the effect? By their united efforts, the column of blood, which has been thrown into the aorta by the heart, becomes displaced: it cannot regurgitate into the ventricle, for, as we have before stated, there are valves at the mouth of this vessel; its course, therefore, is necessarily into the first and larger branches that immediately come off from the trunk itself. A succession of similar phenomena takes place in the branches as in the trunks;—they were full before, consequently the same over-distention happens, and gives rise to a similar repulsive effort of the elastic coat; which, assisted by the muscular, aids, in this manner, in the propulsion of the blood to the extreme parts of the body. It is not to be imagined, however, that these effects happen in succession in the different arteries; on the contrary, the whole arterial system experiences dilatation, called *diastole,* and contraction, or *systole,* precisely at the same instant; hence the pulse, which is

occasioned by the former, occurs in every vessel at the same time.

In this summary view that we have taken of the action of these vessels in the circulation, we have not, nor shall we here, advert to the operation and influence of the heart: suffice be it to say, that the blood is principally circulated by its contractions, though writers on this subject have by no means agreed to what extent its power is exerted. We have observed, that the artery, in resuming its state of systole, displaces a column of blood—and that it does this is evident, for blood of itself is incompressible: we have also asserted, that this column is impelled into other vessels; its regurgitation being prevented by valves, and its advance, we may here add, aided by the enlarged space into which it flows, in consequence of the aggregate calibre of the branches exceeding that of the trunks.

Thus far, then, we have considered the elastic coat as being the chief agent employed in the circulation: indeed, from its prevalence over the muscular in the larger vessels, it has been regarded by some physiologists, as the only one employed in the natural action of these parts. If, however, we examine into the causes of the motion of the blood through vessels in the more remote parts of the body—in which we find the elastic property considerably diminished, while, on the other hand, the muscular has become proportionably augmented, we shall feel inclined to doubt, more especially when we take into our consideration the abatement of the heart's power in these extreme branches, that elasticity alone is equal to the effect. It has indeed been contended, that the heart is the only agent employed in the circulation: of such as maintain this opinion, it may be enquired by what means the blood

is circulated in fœtus formed without hearts? Such *lusus naturæ* have been met with, in which (to reply to the above question) the circulating powers must have wholly resided in the muscular fibres of arteries. As far as experiment and observation have gone in the investigation of this subject, it is now generally believed, that the muscular coat is an auxiliary in the circulation; and that it not only contributes to the efficiency of the elastic, but, in some vessels, exerts a force even superior to it.

In the larger branches, its action will be simultaneous with, and similar to, that of the elastic coat, with which it will restore the vessel to its former size, after its distention with blood from the heart; but in the smaller arteries, it will predominate over the elastic, and further aid the principal circulating power, by contracting them beyond their natural calibre. So that, in the one case, it will co-operate with the elastic, in the other, it will oppose it: and, if this be true, in the latter instance, the elastic coat will be employed in the dilatation, as well as contraction of the vessel.

In the vicinity of the heart, then, the blood is moved along its arterial channels, by the alternate extension and shrinking of the elastic, aided by the successive relaxation and contraction of the muscular: more remotely from that organ, by the more forcible contractile efforts of the muscular, aided by the comparatively feeble action of the elastic coat*.

* The following extract, from Dr. Thomson's valuable work on inflammation, would induce us to regard the capillary arteries as more active and efficient agents in the circulation of the blood, than they are commonly believed to be. "The experiments and observations which I have just related (the application of stimuli—*ammonia*, to the minute vessels in the web of a frog's foot,)

Arteries convey blood from the heart to the different parts of the body for a variety of purposes. We mentioned in our last lecture, that by blood the body was nourished, and its growth promoted--all which is effected by the open mouths of these vessels; hence, they have been compared to a set of workmen, continually employed in conveying materials for the formation and repair of the animal machine. In some places they form bone; in others, muscle; and in others again, tendon; although the blood which they convert into these different parts, is, in all of them, precisel; similar in its properties, being pumped into them at the same instant by the heart. In addition to this, however, the arteries produce all the secretions of the body: the hoof itself is nothing more than a secretion, which the coffin arteries furnish from the blood; urine is separated from it by the emulgent arteries; and semen, by the spermatic. Inflammation, which is commonly a healthy process set up by nature to repair losses the body may have sustained by accident, or disease, consists in a change of action of the arterial system.

On the Pulse.

By the alternate contractions and dilatations of the heart and arteries, is produced that well-known motion of them, called their *beating*, or *pulse*.

prove undeniably, I conceive, the existence of irritability in the smaller or capillary arteries of cold-blooded animals, and consequently the possibility of irregular distributions of the blood in particular parts of the body being produced, independently of the heart, by the vital, contractile, or irritable power inherent in even the minutest branches of the arterial system." *Vide* Thomson's *Lectures on Inflammation.*

At every injection of blood from the heart, the parietes of the arteries are distended beyond their natural dimensions—an effect only perceptible in such vessels as are tightly bound down to the adjacent parts, by the immediate touch, or compression of them; but if, as is generally the case, the artery be but loosely connected to the surrounding parts, then will its diastole become distinctly visible, in consequence of this sudden influx of blood displacing it, and, at the same time, somewhat contorting its canal. A vessel, under these circumstances, may be seen to advance a little, or leap from its place; in consequence of being rendered serpentine in its course, by the gush of blood which the heart has just impelled into it; and it is from this cause, that such an artery produces that jerking sensation under the fingers, commonly called the pulse. We have a familiar instance of a similar effect taking place in injecting these vessels: if one of them happen to be excessively distended with wax, it will, unless prevented by surrounding attachment, always be thrown into a serpentine form; and then it is not only stretched in a lateral, but also in a rectilineal direction. Again, if, in operating, you lay bare an artery that is but indistinctly seen, and tie a ligature around it, you will at once render it perfectly distinguishable, in consequence of the momentary jerks, and alterations of figure, it will undergo, from the impulse of the blood against the ligature. It is, then, precisely on this principle, that we feel the pulse by making pressure upon an artery: by partially obstructing its cavity, we have a peculiar sensation given to our fingers, called pulsation; arising, we repeat, from the impetus of the blood momentarily ejected from the heart.

This pulsatory action does not pervade every part of

the arterial ramification: though its effect is said to be visible in those branches which do not exceed 1-sixth of a line in diameter, yet does it cease altogether in the capillaries; so that the blood in the veins, which are still further removed from the heart, flows in an even and uninterrupted stream.

In consequence of functional derangement of the circulatory system being present, more or less, in almost all constitutional diseases, the pulse is regarded, to a certain extent, as an index of disease—as an important indication of its nature and severity: it behoves us, therefore, to make ourselves well acquainted with the variations to which it is subject, and to know (as far as medical observation has tended to distinguish them) the different morbid states of which they are the signs. At the same time, we are to bear in mind, that, like most other symptoms of disease, it is not to be solely depended on—without a due consideration of all the circumstances of the case.

In all animals, in a state of health, we find, what has been called, a *standard pulse: i.e.* that their heart and arteries pulsate a certain number of times within the space of a minute. In general, the larger the animal the slower the pulse: *e.g.* in the human subject, it is about 72, in the horse about 45, and in the dog about 90.

But the standard pulse of different individuals of the same species will vary; though not, generally speaking, with much latitude; so that we should not deem a pulse of 65, or any number between that and 80, extraordinary in a man; nor should we pay any attention to one ranging between 40 and 50 in a horse: we have heard, indeed, and we think it likely, that the pulse of a thorough-bred horse is somewhat quicker than that of a

horse of ordinary breeding. Again, the standard pulse will undergo some variation at different periods of life: it is always more frequent in the young than in the full grown animal, and slower in the old: the pulse of a new-born infant is 140; that of a man at sixty years of age, 60; the pulse of a colt, six months old, is about 55; and we think it highly probable, that a proportionate diminution attends old age.

When the pulse, however, much exceeds in number the standard, it is called a *frequent*, or *quick pulse: e. g.* one of 55, 60, 70, or upwards, is of this description: the most frequent we recollect ever to have met with in the horse, was one of 120. Very simple causes, as well as most constitutional diseases, and more particularly those of the inflammatory kind, will accelerate the pulse: exercise, temperature, and alarm of any kind, are the principal ones. If, on the other hand, the number of pulsations in a minute be less than forty, it is denominated a *slow* pulse. This kind of pulse is, in general, an indication of disease in the brain; and is very commonly met with in the lethargic, or sleepy stage of staggers. A remarkable instance of preternatural slowness of pulse, occurred in a horse to which we were giving black hellebore: we counted not more, at any one time, than 24 beats in a minute*.

But the pulse, without any regard to its frequency, may

* A grey galloway, who had a chronic ulcerative affection of one side of the *septum nasi*, with tumefied submaxillary glands of the same side, took hellebor: nigr: rad: ʒiss: this produced considerable nausea, loathing of food, &c.; accompanied with exceeding slowness of pulse, and great irregularity of it, which continued for about twenty-four hours; the pulse, then, gradually rose to its natural frequency.

vary in many respects from what is considered as its natural, or healthy state.

In the first place, it may be *hard,* or *soft.* Hard, if the artery is beating with increased force, but with diminished diameter; so that it feels like the vibrations of a tight cord under the fingers: such is commonly the nature of the pulse when active inflammatory disease is present in the system. Not unfrequently, the artery is reduced to an extremely contracted state—conveying to your touch the sensation of a wire; from which circumstance, it has been called the *small, thready,* or *wiry* pulse: it is not uncommonly found in horses that are griped, or who labor under inflammation of the bowels; in other cases, it is strongly characteristic of membranous inflammation, be it in whatever part of the body it may.

A *soft* pulse is one in which the coats of the artery are, from relaxation, preternaturally distended by blood, so that the vessel is more than its ordinary size: under these circumstances, it is easily compressed by the fingers.

In a *strong* pulse, as its name implies, the artery (of its usual calibre) is beating with increased force; in a *weak,* with diminished: the former is frequently present during inflammation of the lungs, after the first bleeding; the latter, in such subjects as are much debilitated from disease.

An *oppressed* pulse is one in which the elastic and muscular coats of an artery are in such a state of extension, that they are unable to contract with their usual force upon the contained blood. In those sudden and severe attacks of inflammation of the lungs, to which young horses are especially subject, either from hot stables, or over-exertion, this is the condition of the heart and larger arteries at the commencement: hence nothing is more

common in these cases, than to find the strength, as well as frequency, of the pulse increased after venesection; in consequence of the plethora of the vascular system being relieved by the evacuation.

The pulse is said to *intermit*, when the intervals between the beats are of unequal duration: it is sometimes called an *irregular* pulse.

There are several parts in an animal more convenient than others for *feeling the pulse*. By applying the palm of our hand to the left side of a horse, immediately behind, and a little above his elbow, we perceive, more or less distinctly, the pulsations of the heart against the sides of the ribs; so that we may, pretty accurately, count them: we meet occasionally, however, with horses in which the motions of the heart are so indistinctly felt, (which generally arises from excessive fatness,) that we are compelled to repair to some other situation. If, therefore, we are sometimes foiled in our attempts to learn the frequency of the pulse by endeavouring to feel it at the heart, it is evident, that we should at no time estimate its strength, weakness, &c. from such a fallacious source. It is by the *compression* of an artery alone against some hard body—as bone, that we can at all accurately ascertain the state of the pulse, and perhaps no artery is better adapted for this purpose than the submaxillary, as it crosses the posterior margin of the lower jaw: here we have an opportunity of including the vessel between our finger and thumb, and of making different degrees of pressure upon it, with a view of learning the *force*, as well as *frequency*, with which it is beating. The temporal, carotid, and pastern arteries, are also, now and then, resorted to for this purpose. It demands, however, some attention, and much varied practice, to acquire

that acuteness of feel—that *tact*, which guides the experienced practitioner in his *prognosis*, and at once distinguishes the man of science and observation, from the intermeddling bungler: to this end, there is no more ready way, than, first, to gain a perfect knowledge of the pulses of different horses in a state of health, and, afterwards, compare them with those of others variously affected by disease.

In forming our opinion of the pulse, we are to be, in some measure, on our guard against any accidental circumstance that may tend to influence it: *e. g.* in the human subject, it is well known that the appearance of the surgeon not unfrequently accelerates the pulse of the patient: alarm of any kind will similarly affect that of the horse. The sensation of cold has a considerable effect on the pulse—it has the power of diminishing the frequency of action of the heart and arteries: if a horse that has a pulse beyond the standard, (in regard to quickness,) be exposed to an atmosphere, the temperature of which is very considerably less than that from which he has just been removed, his pulse will be soon reduced in frequency, though it will beat with more force than before; hence it is, that cold is said to give *tone* to the organs of circulation; and so, in truth, it does, by lessening their frequency, but augmenting their power of action.

There are some medicines that, when introduced into the system, diminish the celerity of the pulse: among those most efficacious in the horse, may be mentioned *digitalis*, and *white* and *black hellebore*. By the use of digitalis, which, it is believed, operates on the heart and arteries through the medium of the brain, the pulse may be considerably lowered, and occasionally rendered intermittent. White hellebore has the same effect by causing

nausea—and this it does most effectually and safely, when properly administered. Aloes will, very frequently, soon after its exhibition, occasion a refusal of food, from its producing some degree of nausea; but we have not remarked, that it is attended with much alteration in the quickness of the pulse. Barytes, given in large doses, will cause the pulse to intermit.

In most diseases the pulse becomes much more frequent than in health; and for this reason, one of our chief objects in the treatment, is to reduce it to its natural standard; or, when it continues excessively quick, the animal must, eventually, sink from exhaustion of its vital powers. Venesection is, as we mentioned when treating of the blood, one of our most efficient remedies for this purpose; and exposure to cold is occasionally employed with the same view: there are two medicines, however,—digitalis and hellebore, which, when properly exhibited, will prove of the greatest utility to us in practice in fulfilling this indication.

LECTURE V.

On the Diseases of Arteries.

EVERY organic part of the body is liable to disease: and *disease* may be defined to be, that change in a part which is characterized by alteration, or suspension of its functions, by pain, and by other well known signs collected from observation. Were we to say with some, that disease consists in any alteration from the healthy state, we should not only be perplexed in correctly defining what *health* is, but find ourselves compelled, in strict conformity with this opinion, to pronounce, at least, two horses out of three unsound. There scarcely exists a horse, that has exceeded five years old, the period of full growth in this animal, that has not a splint *; but we do not consider the animal, on that account, even the less valuable, much more as unsound: unless the splint perceptibly alter the functions of the part, be painful, and so produce lameness; and then, it accords with our first definition, and comes under the head of disease. Were we to attend more closely to this natural division of health from disease, we should meet with less

* A splint is nothing more than an osseous tumor upon the side of the leg.

difficulty in determining the soundness, or unsoundness of horses; less frequently differ in our opinions on this point; and seldom have occasion to incite them who employ us, to encounter the uncertainty of the law.

The most dangerous diseases to which the body is subject, are those of the blood-vessels; for as the vascular system is of the utmost importance in anatomy and physiology, so are its diseases of the greatest consideration in surgery and medicine. In saying thus much, we allude to that condition of an organ, or of the constitution at large, implied by the word

Inflammation.

A PART is said to be inflamed when it manifests the following signs: 1st. *increased redness;* 2dly. *swelling;* 3dly. *pain;* 4thly. *increased heat.* Now we shall take up the consideration of these symptoms in the order they are here enumerated, and illustrate each by examples drawn from the most obvious and familiar occurrences.

We labor under considerable disadvantage in not being able, generally speaking, to inspect the surface of an inflamed part in the quadruped: the hair effectually precludes all our attempts to expose its color. In some organs, however—in the eye, for instance, the redness is the primary symptom; that by which we form our opinion of the intensity of the disease. Every one has seen the white of the eye bloodshot; and more close observers have remarked, that, under high inflammation, every now and then, small red vessels are seen traversing the transparent part of it; obscuring its brilliancy, and thus impairing, or destroying vision. Pre-

cisely the same appearance is put on by the skin, or any other part, when inflamed; of the truth of which, we have often an opportunity of convincing ourselves, by examining the legs of horses denuded of cuticle and hair, from the application of escarotic blisters. Now to explain the cause of the redness. It is simply owing to the presence of the red particles of the blood—they circulating in greater abundance in the smaller vessels of the inflamed part, and being admitted into others which in health only convey the serous, or transparent parts of that fluid: a theory that admits of the readiest possible demonstration. In the first place, we can often inject a part that has been inflamed during life*, although we could not have shewn its vascularity in a healthy condition: secondly, if by any irritant, chemical or mechanical, we excite inflammation in a part of an animal, before transparent and colorless, it will so gradually assume a red hue, that we may actually detect the globules in their passage into vessels previously serous and invisible.

The *tumor* attendant on inflammation, is referable to two circumstances. It may simply be caused by distention of the part, from dilatation of its vessels; or it may be dependant on the effusion of coagulable matter into the cellular membrane, and consequent expression of serum around it†. The *tunica conjunctiva* of the eye is the

* We are not to expect invariably to find parts red in the dead animal, though they have been the seat of inflammation during its life. "The redness of parts which have been slightly inflamed not unfrequently disappears after death, so that it is sometimes difficult to discover the precise spot which, during life, had been the seat of inflammation." THOMSON's *Lectures on Inflammation.*

† "The swelling in inflammation is accompanied with a greater or

best instance of the first: frequently, in violent opthalmia, we see it swollen and wrinkled, when we evert the eyelids, to ascertain the degree of the existing inflammation; though, every now and then, this is dependant on *ecchymosis* *. Of the last, instances enough present themselves, but the best we have is that of the disease called *strangles:* we hardly need advert to the swelling here—it constitutes the very essence of the affection itself, and is to be ascribed, in the incipient stage, to the effusion of coagulable matter and serum into the cellular membrane, between the branches of the lower jaw, and the skin of the throat. If we cut into the tumor in this state, we find the centrical and larger part of it, consisting of a solid mass, which has recently been found to be, the albuminous part of the serum in a coagulated form; and the

less degree of stretching or tension. In the earlier stages it seems to be produced solely by the unusual influx of blood; but no very great increase can be produced by this circumstance alone. As the inflammation, however, proceeds, a quantity of serous fluid is usually poured out into the interstices of the cellular membrane, in the parts contiguous to the seat of inflammation. This produces a kind of swelling which pits under pressure of the finger, and is distinguished by the term *œdema.* In some cases, where the inflammation runs high, the effused fluid is found tinged of a red colour. In other rare cases instead of serum, coagulable lymph, or, as it is now termed, the fibrin of the blood seems to be effused. When this happens, the swelling continues after every other mark of inflammation has disappeared, and remains often during the whole of after life. Swelling and tension, therefore, seem to depend partly on the inflamed vessels being unusually distended with blood, and partly, perhaps chiefly, on the effusion of serum and other fluids into the surrounding cellular membrane." THOMSON's *Lectures on Inflammation.*

* *Ecchymosis* is an effusion of blood from the vessels of the inflamed part.

surrounding parts to be filled with serum in a fluid state, which appears to have been squeezed out from the sides of the *coagulum*. Even in this latter case, however, we do not mean to assert, that distention does not contribute to the tumefaction; though very triflingly so, we apprehend, when compared with what is the effect of effusion.

Increased heat, next to be considered, is, too often, the only satisfactory test we have of deep-seated and destructive inflammation: to disease in the foot indeed, it is almost our only guide; for lameness itself is, generally speaking, but a fallacious symptom—at least, as far as it tends to direct us to the seat of disease. On this account, heat is a sign that we should be nice in our examination for; inasmuch as the acuteness of touch, on such occasions, not seldom distinguishes the practised veterinarian, from the closet inquirer on the one side, and the all-knowing farrier on the other.

It may at first seem strange, that so great a man as John Hunter, should have doubted that the heat of an inflamed part was actually increased; rest assured, however, that he did not do so from theory; on the contrary, we find this opinion (as we know the groundwork of all his doctrine) to be the result of experiment, made under his own immediate observation. His words are, "As inflammation is the principal instance capable of producing local increased heat, I have taken the opportunity of examining inflammations, both when spontaneous and in consequence of operations. I have also made several experiments for that purpose, which are similar to operations, and cannot say that I ever saw, from all these experiments and observations, a case where the heat was really so much increased, as it appeared to be to the sensations." Mr. Hunter, in one experiment,

having ascertained the heat of the rectum in the dog—and, in another, in the ass—threw up a solution of corrosive sublimate; this excited a high degree of inflammation, but, in neither case, was the heat increased more than one or two degrees. Indeed, in one instance, where he had injected the same solution into the vagina of a young ass, after having remarked its natural temperature, which was 100°, the thermometer fell, two hours afterwards, to 99°, and continued so till the succeeding day, when it rose again to 100°: "This experiment," he says, "was repeated several times on the same ass, with the same result." There is much fallacy, however, in these experiments; for it is well known, that the interior parts of the body possess the power of maintaining an equalisation of heat, which will not be altered by placing the animal in a higher or lower temperature; or, as it now appears, under the influence of inflammation. Had Mr. HUNTER have made the exterior of the body the subject of his experiments, he would have found the heat of it not only perceptibly, but actually increased under inflammation*. To prove this, we have nothing more to do than to ascertain the temperature of any external part—say any part of the skin, for

* As, indeed, he did in a patient on whom he operated for hydrocele: a thermometer introduced into the cavity of the *tunica vaginalis*, and kept in close contact with the testicle, indicated a temperature of 92°; next day, however, when inflammation had come on, it rose to 98¾°.—"But even this," says Mr. HUNTER, "was not equal, probably, to that of the blood at the source of the circulation in the same man." This experiment, and others that he made, prove that the heat of an inflamed part never exceeds that of the blood at the heart: in more or less approaching it, however, the temperature of most external organs, under inflammation, becomes very perceptibly and demonstratively augmented.

it will vary under different circumstances, and then apply a blister to it: the heat of it, as soon as the blister takes effect, will rise considerably; though, we believe, seldom, or never, become equal to that of the interior of the body. The cause of this increase of temperature is to be referred to the unusual flow of blood into the inflamed part, combined with the accelerated circulation of it.

The fourth symptom of inflammation is *pain*; one which, like redness, though probably always present, we derive, comparatively with surgeons, but little advantage from, in ascertaining the precise nature and degree of existing inflammation*. Increased sensibility is accompanied by increased irritability; so that those circumstances which but little affect the part in health, produce extreme pain under inflammation: this will throw some light on the cause of pain—which we here refer, to tension of the nervous texture, and possibly pressure on it, from tumefaction of the surrounding parts. Though the horse cannot be said to complain of pain, his expressions of it, to those acquainted with his habits, are often too well marked to pass unnoticed:—the hanging head—the drooping eyelids—the pendulous lower lip—together with the gloomy aspect, and general torpor of the animal, strongly denote dull and continual pain: on the other hand, the wild and unnatural stare—the general irritability of frame—and his frantic, but unavailing

* A remark of peculiar force in regard to inward inflammatory affections. "Pain," says Dr. Thomson, "when conjoined with other constitutional symptoms, is one of the surest marks which we possess of the existence of inflammation in the internal parts of the body:" and, we may add, one of whose kind and seat the veterinary surgeon is too often *painfully* ignorant.

plunges for relief, we need not add, feelingly portray the agony he is in. In local inflammation, not of sufficient intensity, nor importance, to affect the general health, we may form some idea of the pain, by the degree of pressure the animal will bear upon the part without flinching: for instance, in the adhesive stage of *strangles*, the horse very seldom evinces any great deal of tenderness, when we feel the tumor; but if we touch the swelling, ever so lightly, when the suppurative process is far advanced, the animal suddenly snatches away his head, and requires the benumming aid of a twitch, before he will allow us to proceed in our examination.

The *terminations*, or *effects* of inflammation, are of four kinds: *viz. adhesion, suppuration, ulceration* and *mortification.*

When the sides, or edges of a clean-cut wound are brought together, and confined in contact by suture, plaster, or other means, they will commonly unite. Now, it was formerly supposed, that the blood itself, extravasated within the wound, was the bond of union in this case—that it coagulated, and glued the divided surfaces together: recent and more accurate examinations, however, show that it is not the crassamentum of the blood, but the coagulable part of the serum, which, from its resemblance in its properties to *albumen*, has been denominated *albuminous matter*, that cements them: and this, now, in common medical language, is best known by the name of *adhesive matter*. There is no such process as what Mr. HUNTER called *union by the first intention**: we know of no other mode of union than that by *adhesion.*

* "As extravasation arises from a rupture of a vessel, it is of ser-

Should the wound remain unclosed, or should loss of substance happen in any part of the body, either from abscess, ulceration, or sloughing, adhesive matter is still the repairing material; but, in these cases, it is effused in the form of little rounded eminences, at first yellowish, but afterwards red, in consequence of acquiring blood-vessels from the surrounding texture. This constitutes process of *granulation*.

Now, there are some parts of the body more likely to take on the adhesive inflammation than others: what are known as the *serous membranes*, are parts exceedingly disposed to this process. We often find the lungs glued to the sides of the chest, in horses that have died of acute inflammation of these organs, in consequence of the arteries of the *pleura*, (which in health furnish a fluid for its lubrication,) having effused adhesive matter: this is not near so common an occurrence in horses, however, as in the human subject. Now and then, we find adhesions among the intestines, and other abdominal viscera; for the *peritoneum*, like the *pleura*, is one of the serous membranes. It has been asserted, that the horse's skin is naturally insusceptible of the adhesive inflammation: we believe, however, that both experiment and observation will evince the shallowness of such an opinion; and that

vice in the re-union of that vessel; if there are more solids ruptured than a vessel, as in a fracture of a bone; it becomes a bond of union to those parts, and this may be called union by the first intention; but the union is not that of the two parts to each other, but the union of the broken parts to the intermediate extravasated blood; so that it is the blood and parts uniting, which constitutes union by the first intention." Hunter *On the Blood.*

This is one of the few doctrines of Mr. Hunter's, which subsequent investigations have shewn to be erroneous.

it is not to the want of healing powers, but to the means we are compelled to employ to keep the parts in contact, as well as to the difficulty of managing our patient, that we are to ascribe our frequent failures;—but as we shall have occasion, in our lecture on the diseases of veins, to enlarge somewhat on this subject, we forbear to offer more at present.

The adhesive inflammation, though it every now and then do mischief from not being checked, or kept within proper bounds, is to be considered as a restorative, or healing process—one to which, in many instances, the preservation of life itself is owing. Without it, all accidents or operations must have proved eventually fatal: by it a broken leg is united, and rendered as strong, if not stronger than ever—albuminous matter effused, cements the broken ends of the bone, and ultimately becomes bone itself—or it glues the lacerated surfaces of muscles together, and is converted into new skin, should the old have been much injured, or destroyed. A bleeding vessel is only safely and effectually plugged by adhesion; for although the clot of blood within it forms the temporary cause of arrest of the hemorrhage, it is the adhesive matter, afterwards effused, that permanently seals the mouth of the vessel. In fine, be what parts they may that are lost, adhesive matter is the material out of which they are regenerated: gradually it assumes the nature of the substance defective, acquires vascularity and sensibility, and, at last, becomes a part of the solids themselves.

Suppuration consists in the formation of purulent matter. Those arteries which, at another time, spew forth albuminous substance, take on here a different action,

and pour forth a fluid of a cream-like nature, to which has been given the name of *pus*—in vulgar language, *matter*. Now, in the human subject, the formation of pus (in abscess) is denoted by two remarkable alterations; one affecting the part itself, the other, the constitution. With regard to the former, the pain in it, which during the adhesive process had been dull and uniform, as soon as the suppurative has commenced, becomes, what surgeons call, *darting* and *pulsatory*: this, combined with the general enlargement of the tumor, the elevation of its centre, the blush upon the skin, and last, and most characteristic, perceptible fluctuation, leave no doubt as to the state of the part; though the pus may be, and often is, deep-seated. Then, as to the constitutional symptoms—the formation of matter, if it be at all considerable, is generally ushered in by a shivering fit; the pulse also commonly undergoes some variation about this period.

In the horse, generally speaking, we must content ourselves with a cautious examination of the swelling itself. Should the case be one of external abscess, the increased hardness and tenderness of the tumor, the tensity of the skin covering it, together with its perceptible prominence, will indicate that suppuration is likely to ensue; though the period of distinct fluctuation, is probably that alone at which we can safely offer an opinion. We are not going to contend that even extensive suppurations in the horse, are always preceded by shivering; but we think differently from him, who would assert that nothing of the kind ever happens: we have certainly seen young horses, having strangles, in whom something very analagous to a cold fit was present about the period of suppuration; and that there often is an accession of fe-

brile symptoms—such as acceleration of pulse, quickened respiration, and general heat of body, will, we suppose, not be doubted*.

As there are particular structures in the body disposed to take on the adhesive action under inflammation, so there are others in which a suppurative process almost always ensues. All mucous surfaces, generally speaking, are of this description: if a horse contract a catarrh, (which is an inflammation of the mucous membrane lining of the nose,) we have not adhesive matter, but pus discharged from the nostrils. Most wisely and providently is it so ordained by nature; for had these parts been equally disposed to the adhesive process, every common cold must have terminated in *roaring*—and occasionally proved destructive to life. Indeed, we sometimes find that mucous surfaces do throw out adhesive matter; and they scarcely or never do so, without its being productive of some ill consequences: the interior of the trachea, for example, every now and then is coated with adhesive matter, giving rise to *croup* in the human subject, and *roaring*, or *thick wind* in the horse. It is from the readiness with which mucous membranes run into suppuration, that an opening into a joint is attended with so much danger to life: unless the cavity be speedily

* During our pupilage, we remember that Professor COLEMAN made no mention of *fever* in his lectures: we concluded, therefore, that its presence was, and we believe is still, denied. In many, indeed in most books of farriery, it is described. We are here close upon the confines of this very important, and interesting question; we must, however, and we do so with some reluctance, inasmuch as its discussion would be opportune enough in this place, reserve what we have to say on it for another part of the course.

closed, general suppuration of it takes place, ulceration ensues, and *anchylosis*, either partial or complete, is the ordinary event. Should we succeed, however, in producing early the adhesive process in the opening, we seal up the joint, and guard against these truly melancholy and irremediable consequences.

Hitherto, we have considered inflammation, and its effects, as consisting in an increased action of the arteries: we have now to show, that it sometimes appears to give rise to altered function on the part of the absorbents. When parts are removed by absorption, without any, or proportionate deposition, they are said to *ulcerate*. It was formerly supposed, that ulceration could not happen without suppuration; but we now know, that the presence of pus is not necessary, inasmuch as it, now and then, takes place without it: the best example of this is *aneurism*—of which we have seen but one case in the horse, though it is a common disease in the human subject. Suppuration is, however, generally a concomitant of ulceration; and it would appear, that the pressure of the pus is the stimulus to the absorbents to act, as is well illustrated in a common abscess. Though, relative to this process, is this very curious fact—that absorption always proceeds to the skin, and never internally; for if an abscess form between the abdominal muscles and the peritoneum, we believe that the matter will invariably make its way to the skin. Pressure however cannot, in all instances, be adduced as the cause of ulceration; for in glanders, a disease the very essence of which is ulceration, no such excitant is present.

The fourth termination of inflammation is in *gangrene*, *mortification*, or *sphacelus*. These terms are perhaps, strictly speaking, not synonimous; in common use how-

ever, they are considered so, and as such we shall adopt them here. Arteries, in which inflammation is generated and supported often as a salutary process, now and then, from excess of inflammatory action, become the agents of destruction to the parts to which they are distributed—even themselves the destroyers of their own vitality. Blood in undue quantities is impelled into a part by the increased action of its arterial trunks ;—the vessels of the part itself are rendered powerless by distention ;—at length every channel becomes overloaded, blocked up, and unable to relieve itself;—and the part dies from obstructed circulation. Another cause of obstruction, but a very rare one, is the adhesive process taking place in the interior of arteries, and obliterating their canals.

You will not infrequently meet with accounts of mortification in horses in books on farriery, or hear some of their followers of the present day assert, that *a horse died as rotten as a pear*. But the truth is, that we have no instance of mortification in the horse—defining it to be, a total destruction of the powers of life—the death of a part; at least, we have never seen, nor even heard of one in which we could place any reliance on the judgment of our reporter. Horses who die of severe injuries, followed by high and extensive inflammation, sink prior to the gangrenous stage, and they appear to do so from excessive nervous irritation. The nearest approach to sphacelus, and one which we can adduce, if we can any, as an example of it, is that condition of the lungs where death has quickly supervened on acute inflammation of them: even here however, the parts cannot, correctly speaking, be called gangrenous.

Inflammation has been divided into several kinds, or species. When its attack is sudden and violent, and its progress quick, it is termed *acute;* but when of a tardy, lingering, and milder nature, the epithet chronic serves to denote it. Again, inflammation may either be *healthy*, or *unhealthy*, a distinction that appears to relate to some peculiarity of constitution; or it may be *simple* or *common*, or *morbid* or *specific*. Any inflammatory affection arising from ordinary causes, is simple or common: those alone are morbid or specific, produced by particular causes, and not under the power of ordinary remedies.

The causes of inflammation are generally ranked under three heads:—the *remote* or *predisposing;* the *occasional* or *exciting;* and the *proximate:* we shall consider them in this order.

That may, in a general light, be looked upon as the remote cause of inflammation, which renders a part more susceptible of the action of the immediate or exciting cause; or which, in common medical language is said to impart a predisposition. Particular constitutions are said to be predisposed to particular diseases; and here the predisposition would seem to be inherent in the original conformation, or contexture of parts: white-legged horses, we know, are predisposed to grease; light chesnuts, to disease in general; narrow chested, to pulmonary affections; and large long-necked horses, to become roarers. As an external agent, inasmuch as heat is by far the most frequent exciting cause, cold appears to be that which predisposes the oftenest: when we say, that a horse has caught a cold—by which we mean an inflammation of the membrane lining the air

passages—we do not believe that cold has absolutely produced the disease, though it is named so from this circumstance; on the contrary, we suppose that heat, in almost all cases, has been the exciting cause*.

The exciting causes of inflammation are various and numberless: they may all, however, be reduced under two general heads. In the first class are comprehended all such as act by their stimulant, or chemical properties:—heat, cantharides, turpentine, the mineral acids, the caustic alkalies, &c. The second class includes those whose operation is purely mechanical: as pressure, friction, wounds, bruises, fractures, &c.

The proximate cause of a disease may be considered as its essence;—that on which its presence depends—without which it could not exist—and by whose changes its nature must be perpetually altered. The opinions of the most distinguished medical men, have varied exceedingly in respect to this important subject; more perhaps than on any other with which we are acquainted. The ancient medical philosophers, unacquainted with the circulation of the blood, supported for a long time the doctrines of

* It would appear from the following paragraph, that Dr. THOMSON considers cold, in this case, as a direct excitant of inflammation. "In some instances cold, or a diminution of temperature, seems to act more directly upon the parts with which it comes in contact. We have examples of this in the inflammation of the mucous membrane of the nose, fauces, trachea, and bronchiæ, from the inhalation of cold air; and in the production of rheumatic inflammation from the accidental exposure of some part, or other of the body to cold. The application of cold, in the instances I have mentioned, seems to have somewhat of a *directly exciting effect;* and perhaps the same remark is still more applicable to the local effects of cold in the production of the inflammation accompanying the state which is usually denominated frost-bite."

fluxion and *congestion**: these were exploded by their more enlightened successors, who adopted in their stead, those of *obstruction*—first promulgated by the celebrated BOERHAAVE †, and of spasm—the theory of the ingenious CULLEN ‡.

Even at the present day, very eminent medical men are divided in their opinions, relative to the state of the capillaries under inflammation: some contending that they

* By *fluxion* is meant a flow of the humours, or blood, to any particular part; by *congestion*, a stagnation of them: both giving rise to inflammation.

† BOERHAAVE thought, that the minute vessels were blocked up from the thickness, or viscidity of the blood, in some inflammations; while in others, the same effect happened in consequence of the larger globules having been impelled into them; which last he called an *error loci*. With regard to the first of these—*viz.* viscidity of blood, no such condition of it can be demonstrated: we believe that the blood in all parts preserves its fluidity alike. But, in reference to the second, we do not deny the fact; we believe that the globules are circulating within vessels, before impervious to them. His deductions, however, we cannot admit;—we consider the *error loci*, as he terms it, to be an *effect*, and not a *cause* of inflammation; but that no obstruction whatever ensues, since the circulation is still carried on, though the part be inflamed.

‡ Dr. CULLEN's theory, like BOERHAAVE's, is one of obstruction; instead of attributing the cause of it, however, to the blood, he transfers it to its vessels: "The cause of obstruction," he says, "is spasm of the extreme arteries supporting an increased action in the course of them." Now, the very condition which we know to be an effect of inflammation, is pre-existent to the spasm;—*viz.* congestion; so that spasm would be a consequence, and not a cause of it, as the *error loci* of BOERHAAVE's evidently is. But we have no proof that these vessels are in a state of spasm; and even if they were, are we sure that it would be productive of inflammation.

are acting with diminished force; while others maintain that their action is preternaturally increased. Both parties admit, however, that blood is contained in the inflamed part in an unusual quantity, and that these vessels are, consequently, dilated beyond their natural diameter: they also agree, in rejecting all idea of stagnation. It would carry us very much beyond the prescribed limits of this lecture, to enter into a detail of the facts, and ingenious arguments, by which each has supported its favourite theory: but with relation to the doctrines promulgated in our metropolitan medical schools, we believe that the latter is the one more generally espoused. We would refer those who wish for information on this important subject, to Dr. THOMSON's excellent work on Inflammation: in which, from some experiments that were made on the frog's foot, whereby a state analogous to inflammation was induced, the author has come to the following conclusions: "First, that the velocity of the blood, so far from being always diminished in inflamed vessels, is often increased, particularly in the commencement of inflammation; and that this increase of velocity may continue in the capillary vessels from the commencement to the termination of that state. This increased circulation, I am inclined to believe, exists in a greater or less degree in that state which has been denominated active inflammation. Secondly, that a diminished velocity in the circulation through the inflamed capillary vessels, may take place in the very commencement of inflammation, and may continue during the existence and progress of that state. Thirdly, that this diminished circulation in the inflamed capillary vessels takes place, however, more frequently in the progress than at the commencement of inflammation in healthy and strong persons; and that it

is probably a state which occurs in those inflammations which have been denominated passive."

"If this view of the state of the circulation in inflamed vessels be just, it will follow that inflammation is sometimes attended by an increased, and at others by a diminished velocity in the circulation through the capillary vessels of the inflamed part; and consequently that neither of these two states ought to be included in the definition which we give of inflammation."

Inflammation is *treated* either by constitutional, or local means: we shall first consider the former.

Constitutional remedies are required when any vital or important organ is the seat of disease, which gives rise to sympathetic irritation in the system at large. Should the stomach, or intestines be inflamed, we know that the heart and arteries will pulsate with more than ordinary strength and frequency, and that other febrile symptoms will manifest themselves; which, unless checked by timely and proper means, may run on, with redoubled violence, until the animal die from exhaustion. A puncture in the foot—a contusion on a bone*—or an open joint, will not unfrequently destroy life in this manner. Our principal constitutional remedies are such as act on the system by depletion: they are, in a general sense, comprised in the epithet, *antiphlogistic*.

We possess no means so effectual for the relief of inflammation as venesection. Whenever the case is at all urgent, either from the magnitude or importance of the part inflamed, and the constitution and condition of your

* We have seen two or three cases in which death has supervened from accidents of this nature, though the external wound has been but slight.

patient are good, draw blood with freedom; and do this as near to the seat of disease as circumstances will permit. Supposing the case to be one of inflammation of the laminæ*, lose no time in opening the inferior coffin artery, and taking away three or four quarts of blood; an operation that will not seldom arrest the disease in the onset: again, should the horse be the subject of *staggers*, speedily have recourse to copious venesection, from the jugular veins, whereby you detract blood from the vicinity of the brain, and gain the advantage of a local, as well as a constitutional effect †. We before stated, that blood in acute inflammatory disease should be drawn from a large orifice: we may add here, that the efficacy of the operation will commonly be greater the sooner it is put into force. Of such value is this remedy in veterinary practice, that it is on many occasions the only one in which we place confidence for the cure; indeed, there are some cases that will not admit of any thing else being done, that can have any effect in restoring the animal to health. It is not only our most important means of cure, but that which of all others is most universally adopted: a horse is seldom brought to us with any constitutional disorder whom we do not bleed; and with the greatest advantage do we do so, since almost all the diseases we have to treat, essentially consist in acute inflammation.

* Vulgarly called, *fever in the feet.*

† We have no means of drawing blood from the part itself; but we generally can (and should be continually on the alert in practice to reap the advantage) take it from a vessel connected with it: a pint of blood let from an artery going to, or a vein immediately derived from the diseased part, is equal to half a gallon drawn from the system at large.

Though venesection is highly beneficial, generally speaking, in violent inflammations, there are cases of a specific nature, in which it should be altogether omitted, or had recourse to with considerable caution; inasmuch as we seldom have seen good result from it, and we are not sure that it has not been occasionally productive of harm. In the suppurative stage of strangles, bleeding is never necessary; nor, indeed, in the adhesive, unless we wish to avoid the formation of matter. In glanders, we have never witnessed any benefit from venesection: and we abstain from it commonly in the chronic stages of farcy.

Next in importance for the abatement of inflammation comes *purging*. Though not so potent a remedy, it is one even of still more extensive adoption than blood-letting: for a case rarely presents itself, requiring our aid, in which purgatives, in one form or other, are not imperiously indicated; so valuable, indeed, is a purgative medicine to us, that, were we not in the possession of any, we might lay aside all other curative means, as insufficient to establish the utility of our art.

Aloes, almost the only medicine on which we can depend as a purgative for horses*, is to be administered in doses apportioned to the size and apparent strength of constitution of our patient, and to the impression we wish to make on the system. To a horse in health, under ordinary stable management, we give about six drams†; to one with staggers, a disease in which there is much

* We shall discuss this question at large, in our lecture *On Purgation, and Purgative Medicine.*

† ℞ Aloës Vulgar. Ext. Pulv. ʒvj. vel ℥i.
Ol. Menth. Piper. gtt. xx.
Syrupi — q. s. ut ft. Bol. statim sumend.

torpor of the bowels, we would give twelve: but the judgment of the practitioner will best determine the dose. How numerous the cases are in veterinary practice, curable by the administration of a single dose of purgative medicine, and how important an article aloes is in our pharmacopœia, will best appear in the course of these lectures.

Should the first dose of aloes not take effect, it is seldom safe to repeat it, in ordinary cases, under the space of twenty-four hours—the period at which its operation commonly commences.

Sometimes we exhibit aloes in a laxative form: with this view, we give two or three drams, or from that to half an ounce*, once a day, or every other day, until purging is produced. Now and then, an alterative medicine is compounded of it—the efficacy of which simply depends on a still smaller division of the aloes: we give one, and even half a dram†, once or twice a day, or every other day, according to the nature of the case.

Calomel in large quantities will purge a horse: not invariably however, for we have given it in half-ounce doses without its having been productive of even a laxative effect. Let it be noted here, in respect to this medicine, that it is one that cannot with safety be administered as a purgative, and, therefore, one which we never think of employing with that object—unless in

* ℞ Pulv. Aloës. Vulg. ʒi. vel ʒij. vel ʒiij.
Pulv. Glycyrrh. Rad. ℥ss.
Pulv. Zingib. —— ʒi.
Syrupi ——— q. s. ut ft. Bol. omni die, vel om. alt. die sumend.

† Ut supra.

conjunction with aloes*, whose operation it is said to render more violent.

It is a principle in physic—one a scientific practitioner never loses sight of, that medicines which excite nausea, diminish, in a very perceptible manner, the power and frequency of action of the vascular system, and dispose the skin to perspiration. Now, veterinary surgeons bleed in inflammatory disease with good effect, and purge with good effect, and yet we are told, that they do not nauseate with good effect. The horse's fauces are so constructed as plainly to demonstrate that it was not intended he should vomit, as a man does; and only one half of his stomach is susceptible of the operation of medicine: but, opposed to these facts, we have two others equally true, in practice;—the one is, that when we excite efforts to vomit, no ill effects whatever result; and the other, that the greatest benefit is derived from nausea, a state we can at any time produce and regulate with equal certitude. The root of white helebore† is the medicine we have been in the habit of employing for this purpose for the last ten years, and we feel no scruple in adding, with the best effects;—it lowers and weakens the pulse, relieves the distended vessels of the inflamed part, and promotes that smooth and glossy condition of skin, which is evidence sufficient, in the horse, of our having excited diaphoresis:

* ℞ Hydr. Submur. ʒi.
Aloës. Vulg. Pulv. ʒv. vel ʒvij.
Syrupi ——— q. s. ut ft. Bol.

† Neither ipecacuanha, nor the tartarized antimony possesses virtue as a horse medicine. Very large doses of them may be given—two ounces of the latter, without producing any apparent effect.

these are not fabricated reports—they are the result of long experience and close observation, and such as we are not likely to concede to argument grounded upon any analogical or theoretical conclusions. The common dose is a scruple* of the powdered root, once, twice, or thrice a day, according to the effect we are desirous of producing: during its exhibition we are frequently to examine the pulse with attention, in order that we may detect its influence on it as early as possible, and either omit its subsequent use altogether, or give it in smaller doses, or at longer intervals. The effect of nausea is further indicated, by the horse's becoming suddenly dull and torpid —by his hanging his head down, or resting it upon the manger—by his refusing to eat, or drink—and by his frothing at the mouth: which last event is characteristic of excessive nausea, and only precedes, should the medicine be carried further, distressing and unavailing efforts to vomit. Even this effect of it, however, is attended with no danger, and only requires a little time to subside. On the whole, next to aloes, it is the best medicine with which we are acquainted to combat acute inflammatory disease; and the *only* one we are yet in possession of as a diaphoretic.

Diuretic medicines, classed with those whose effect is to restore the suppressed secretions, while they act as evacuants, are serviceable in inflammation. Common turpentine†, resin, and soap are the remedies generally made use of to excite the action of the kidneys: conjoined in various proportions, or simply mixed with other

* ℞ Pulv. Rad. Veratri ℈j. vel ℈ij.
Pulv. Flor. Anthemidis ʒss.
Syrupi q. s. ut ft. Bol. bis terve die sumend.

† *Terebinthina Vulgaris* of the London Pharmacopœia.

substances, perfectly inert, according to the fancy of the practitioner, they form our common *diuretic*, or *urine ball**. These balls should be given, in the generality of cases, about every other day; though sometimes they are required every day, and even twice a day, towards the decline of disease: their use is more especially indicated, where any dropsical depositions are left, we are anxious to promote the absorption of†.

If narcotic medicines are of service to horses, we have yet to learn what they are, and in what cases they should be exhibited: we occasionally give opium, but never with a view of allaying pain and irritation, or procuring sleep.

With reference to diet and regimen—generally speaking, it is proper to substitute bran for corn, or beans; and feed with green meat, in lieu of hay, should it be in the spring, or summer season: unless the case be one of inflamed bowels, and then, probably, the animal should

* ℞ Terebinth. Vulgaris ℥ss.
Ol. Juniperi ——— ʒi.
Pulv. Glycyrrhizæ q. s. ut ft. Bol. alternis diebus sumendus.

Or the following:

℞ Resin. Flav. Pulv. ℥ss.
Saponis duri —— ʒij.
Ol. Carui ——— ʒi. M. ft. Bol. omni die sumendus.

† We would remark here, for the information of the young and inexperienced practitioner, that the horse is an animal very susceptible of the action of diuretics; so that too large doses, but more especially the too frequent repetition of them, will never fail to induce a state of general debility, should they not be followed by nephritis. Let their effects, then, always be inquired into; and, where we have occasion to administer them often, let the general health and condition of the horse be particularly attended to.

be fed with fermented provender. Now and then the appetite is so bad, that scarcely any food at all is taken: when this is the case, we should not allow the horse any other drink than what contains some nutritive ingredient; —either water-gruel, barley-water, decoction of arrow root, or infusion of linseed, will commonly be preferred by him; and prove an excellent *panada* until his appetite be restored. Sometimes it becomes necessary to drench him with one or other of these fluids, in order to support life, until the power or inclination return of feeding himself.

With the exception of lameness, and some few other cases, which require a stationary condition, what is called a *loose box*, is the best possible situation for a diseased horse: here he moves at pleasure, puts himself into that posture most easy to himself, and favorable to his cure, and experiences altogether an indulgence which we should by no means think lightly of in practice. Independently of this, however, it may happen that exercise becomes necessary; and when it is, let it be confined to that of walking: we know of no instance in which a sick horse is benefitted by trotting, or galloping; but we have met with many, where simple disorder has been converted by it into alarming and fatal disease.

The *local*, or *topical means* we possess for the abatement of inflammation, are few and simple. One of the most powerful is the application of *cold:* this reduces the temperature of the inflamed part, lessens its acquired, or morbid sensibility, and lowers the action of the arterial trunks connected with it. The coldest water, or ice itself, may be employed for this purpose; the first by means of cloths frequently renewed, the last by being inclosed in thick coarse bags. Few practitioners, however, put faith enough in cold water to employ it without

medication; and by far the most common addition to it, is the superacetate of lead—in the proportion of about half an ounce to a quart; which gives it an astringent, and, some think, a sedative virtue: to this it is advisable to add about two ounces of distilled vinegar, in order to prevent any decomposition. As a wash which proves by evaporation still more refrigerent, at the same time that it possesses the astringent and sedative properties of the former, we may combine spirits of wine with it*; or we may use simply spirits of wine and water†. With regard to the lead wash, it is by no means clear to us that it possesses any advantage, as an application to the skin of the horse, over common water; inasmuch as the preparation itself, even in ounce doses, taken into the alimentary canal, is perfectly innocuous. As a common astringent lotion, the sulphate of zinc dissolved in water—half an ounce to a quart, is one of the best; or we may substitute common salt for the zinc, adding double the quantity: recollect, however, that, generally speaking, neither of these last is to be applied to a surface acutely inflamed; for they both possess slightly stimulant, as well as astringent properties; and this gives them the preference in many chronic affections.

Sometimes warm applications are to be preferred to cold; but so undefined are the cases in which each is proper, that one practitioner will frequently employ the former, while another insists that the latter is more effica-

* The liquor plumbi subacetatis saves much trouble in making the Goulard lotion—about two tea spoonsful of it are sufficient for a pint of water. To make this an evaporating lotion add two ounces of spirits of wine.

† ℞ Spts. Vini. Rect. ℥iij.
Aq. Fontanæ —— lb. j. M. ft. Lotio.

cious: in the generality of instances, we should use the cold. Strangles, where we wish to promote the suppurative stage, is the only case which now occurs to us, in which most practitioners would order a warm bath, or a poultice, rather than a cold wash. Heat itself—dry heat, has the effect of exciting or increasing inflammation; but when united with moisture, it diminishes inflammatory action, by exciting perspiration upon the surface, and consequent evaporation: so that its ultimate effects are, probably, not very different from those of cold. Bran is occasionally used for poultice; but it is very inferior, on many accounts, to linseed meal *, which we now, therefore, always prefer.

In cases of extravasation of blood from a blow on a part, or where the cellular texture is filled with adhesive matter, and the inflammation that has given rise to it, is on the decline, what are called *discutient lotions* †—such as discuss the swelling by rousing the action of the absorbents, are often of service.

Blisters, rowels or setons, rubefacients, sinapisms, and the actual cautery, are remedies in the veterinarian's catalogue, whose operation is different from those already detailed. In regard to them all, we may lay it down as an invariable rule, that they are not to be employed to a

* Pour as much hot water into a pan as you think sufficient for the poultice you are about to make, and then stir in linseed meal, until the mass acquires a proper consistence.

† What we are in the habit of employing is this:

℞ Ammoniæ Muriat. ℥ss.
Spts. Vin. Tenuioris }
Aceti ——— } sing. ℥viij M. ft. Lotio.

or this,

℞ Liq. Ammon. Acet. }
Spts. Vin. Rect. } sing. ℥vj. M. ft. Lotio.

part inflamed; on the contrary, they do good by exciting inflammation in a part itself free from it; though the nearer they are applied to that originally diseased, the greater benefit is likely to result. Some of them simply produce a determination of blood to the part they affect, and thus relieve (as we say, by derivation) the neighbouring inflammation: this is the case with what we may call rubefacients—though their effect as such is not ordinarily visible on the skin of the horse, and with sinapisms. Others—as blisters, rowels, and setons, not only inflame, but excite a discharge from the parts they are applied to, and thus act by evacuation, as well as revulsion: in addition to these more apparent effects, however, they seem to lower the action of the vessels supplying the inflamed part, and work altogether a salutary influence, that we are not able probably well to explain.

The effects of inflammation are best met with blisters, and stimulants of various kinds. When the primary action has subsided, and an adventitious deposit remains, our object is to re-excite inflammation, with a view to its ultimate removal. Blisters exceed in efficacy all other means for this purpose; and though we occasionally make use of stimulants, and now and then of escharotics, we hardly ever succeed so well in the end.

The actual cautery, (firing,) considered as the veterinarian's last resource, is one of his most potent, and when properly handled, one of his most effectual means to renew inflammatory action, and excite absorption: it does the former by its immediate stimulating effects; the latter, it commences by stimulation, but promotes considerably afterwards by pressure, having the same effect as a tight bandage applied to the part.

La Fosse appears to entertain the same empirical notions about firing, as the common farriers do in this coun-

try : " Ce que les médicamens ne guérissent pas, le fer le guérit : ce que le fer ne guérit pas, le feu le guérit : et ce que le feu ne guérit pas, il faut le regarder comme incurable."

On Aneurism.

An aneurism may be said to be, any tumor formed upon an artery, so as to communicate with its interior.

Aneurism, commonly as it is seen in the human subject, is so rarely met with in the horse, that we should not have thought it necessary to have made any mention of the disease, had there not been in the museum at this place, a very fine specimen of *aneurism of the thoracic aorta*. It is a dried preparation, about the size of a common pumpkin, perforated underneath by two large circular apertures, through which it has discharged its contents into the chest. The sac is in many places extremely thin, and puts on internally, so far as we can examine it in its present state, the appearance of ulceration : but whether it consist of an adventitious substance, or be a dilatation of the coats of the vessel, (though we are much inclined to regard it as the former,) it is not easy to determine. In a word, all we know concerning it, is, that it was brought from the slaughter-house, and has been many years in our possession : as a preparation we think it valuable, being one of the few specimens to be met with of this disease *.

* Writers, in general, have been silent on this subject : a further proof of the rarity of these cases. Mr. Feron, in his *Treatise on Farriery*, has entered into some description of the nature of aneurisms, without having particularized such as belong to the horse ; so that we are at a loss to know whether he has had any cases of the kind, and if so, what they were.

LECTURE VI.

On the Veins.

THE veins are those vessels which convey back to the heart the blood distributed by the arteries to the different parts of the body.

The veins commonly exceed the arteries in number, as well as size; according to some writers, in threefold proportion: in some parts, however, they correspond in both these particulars to the arteries—as in the lungs; while, on the other hand, in others, they are manifold their number—of which the foot is the best example.

There are ten principal venous trunks. Two, called the venæ cavæ, return the blood from the body generally to the right auricle of the heart: eight, denominated pulmonary veins, convey it from the lungs into the left auricle. In addition to these, there is a small vein, named the coronary, unconnected with any trunk, which empties itself into the right auricle.

The veins, unlike the arteries, are divided into two orders:—a *superficial*, and a *deep-seated order.* The former take their course superficially, being commonly found immediately beneath the skin, hence sometimes called *subcutaneous:* the latter, of smaller size, for the most part

accompany the arteries; two of them, thence called venæ comites, are frequently found running with a single arterial trunk. The superficial and deep-seated sets have free communication, by means of anastomosing branches, with each other; of which the common operation of venesection affords a good demonstration. If, for example, you are drawing blood from the shoulder of a horse, and you take up the other fore leg, you know that the blood will flow in a much freer stream, than if you allow the animal to favor the limb from which you are taking it; for, by making him exert the muscles of the bleeding leg, the blood is pressed from the deep-seated into the superficial veins.

Veins take their origin in four different ways. The first, and most common, is that from the termination of arteries, which we endeavoured to prove, when speaking of those vessels, was by direct continuity of canal. The second source from which they spring, is from the interior of *cells:* the corpora cavernosa penis and the spleen are considered as instances of this. The third mode of origin is also from the internal surfaces of cavities, but which are called *sinuses:* these are much larger than cells, and are found within the layers of the outer membrane of the brain, called the dura mater. The fourth, and last venous root, is that from the termination of other veins; well instanced in the vena portæ—a vein that supplies the liver with blood, (therefore somewhat similar to an artery,) from the extreme ramifications of which other minute venous radicles proceed.

All the veins in the body ultimately conjoin so as to form ten trunks; which, as we have just stated, pour their blood into the auricles of the heart.

Veins, although elastic in their composition, have not,

like arteries, a proper elastic coat. They have only two coverings:—a *muscular*, and an *internal* or *membranous coat*. That these vessels are elastic, may be proved by simple extension of their substance, either in the dead, or living animal—the vessel will be found, after being stretched, to contract itself to its former dimensions: it would appear however, that they are more elastic lengthwise than in their diameter; for we know that they do not, when empty, maintain their cylindric shape, nor preserve circular apertures when divided.

The external or muscular coat of these vessels, is much thinner than that of the arteries; and its fibres are less distinct, being only traceable by the naked eye in some few of them: no wonder, therefore, that its existence, by some anatomists, should have been altogether denied. But there are facts which seem to prove the presence of such a coat, however indemonstrable it may be by actual dissection. We frequently see the superficial veins after exertion, especially those of thorough-bred horses, distended with blood: now, if in this condition the animal be allowed to remain at rest, and more particularly, if he be removed into a cold atmosphere, in the course of a short time, we shall no longer perceive the subcutaneous vessels equally numerous, nor those, still in view, equally turgid; from which it is evident, that the veins must have possessed a power of contraction—or how could they have rid themselves of their redundant blood? Again, in bleeding, we know, if pressure be made on the jugular vein for a short time previously to opening it, that the blood will gush out with considerable force, as soon as the lancet is introduced; and this appears to arise from the elasticity of the vessel; for if the vein be examined after some blood has been drawn, we shall find that it has

absolutely become smaller in its calibre, than it originally was; a fact we cannot well account for, unless we admit the muscularity of veins*.

The second, internal, or membranous coat, is perfectly smooth upon its inner surface, dense and elastic in its texture, and possesses more strength than that of an artery: we say this, because if you make a ligature ever so tight on a vein, you will not divide this tunic, unless you cut through the vessel itself, as is invariably the case, when you draw one even moderately tight on an artery. By its smoothness internally, it affords free and uninterrupted passage to the blood; and by its density, exudation is prevented.

These vessels are furnished with their vasa vasorum; consisting of minute ramifications from the neighbouring arteries, and of small veins, called venæ venarum, which avoid emptying themselves into the trunk from the coats of which they return the blood. Nerves, and there can be no doubt absorbents, enter also into their composition.

Within the cavities of veins, are many semicircular, loose, membranous projections, called valves: there is commonly but one, sometimes two, and at others three of them, attached to the circumference of the vessel. In a section we took from the central portion of the jugular vein, eight inches in length, we found, on slitting it open, two pairs of valves in the upper part, at the space of two inches apart, and in the lower, three single ones—a tricuspid valve, whose edges were accurately adapted to

* Blumenbach says, that the muscular coat exists in the largest trunks only.

Now, it has long been a question among physiologists, to what causes the motion of the blood in the veins was to be attributed; for, when we recollect how distant many of them are from the heart, that the blood in them is flowing from a larger into a smaller space, (taking the comparative aggregate calibres of the trunks and branches,) and that it is, in many places, flowing contrary to its own gravity, we shall perceive that no inconsiderable force is required for this purpose. By some, the *vis-a-tergo,* as it has been called, or the force of the heart from behind, has been supposed equal to the effect; while others, with more appearance of feasibility, have regarded the veins themselves as not altogether passive in its transmission. Indeed, if we consider the propellent power the left ventricle must possess, in order to move such a mass of blood through these tubes, so remote from its operation, and, at the same time, calculate the sum of resistance opposed to it, by the interposition of the capillary system, and various other causes, we shall be inclined to seek further for agents of propulsion. On the other hand, we are not to reject the power of the heart altogether, merely because the blood flows with an uniform stream in the veins; for the absence of pulsation in them, is no proof that the motion of the blood is not influenced by the contractions of the heart: the extreme division which this fluid undergoes in its circulation through the capillaries, and the tortuosity and complication of the numberless small veins, account for the regular and uninterrupted stream which we meet with in their larger branches. To prove that this is the explanation of the fact, if you open a vein that has free and direct communication with the extremity of an artery, the blood will flow from it with the same pulsatory motion, as if the artery itself had been penetrated; but if the

vein be one of large size, remotely situated from any arterial communication, or if it be one that springs from the union of numerous capillaries, that smooth and even stream, with which the blood circulates in the trunks, will be observable here. These facts, then, lead us to conclude, that the force of the heart is not sufficient of itself to propel blood through the venous system.

From the collected accounts of writers on this subject, it seems highly probable, that the blood, flowing in the veins, receives additional momentum from the reaction of the capillaries—which we spoke of in a former lecture: and that it is further urged on by some contractile force resident in these vessels themselves. That the blood is advanced in its course by the action of those muscles contiguous to veins furnished with valves, is, without doubt, well founded, as far as an occasional auxiliary is concerned, as the common operation of bleeding demonstrates; for it is in consequence of muscular pressure upon the veins about the head, that the motion of a horse's jaw accelerates the flow of blood through the jugular vein: as such, however, it cannot be ranked among the essential causes of the blood's motion in them.

Although the blood in the venous system for the most part flows without intermission, the large veins near the heart have a sort of pulsatory action excited in them; so that, at first sight, on laying them bare, we might suppose them to be the trunks of arteries: they pulsate, however, from a different cause; in consequence of a portion of blood regurgitating into them, during the systole of the auricles, there being no valves placed at their termination in the heart, to prevent such reflux. This retrogade motion of the blood may be observed in the venæ cavæ,

jugular, and pulmonary veins; so that, in them, the blood really appears to ebb and flow: a circumstance probably that led the ancients into error concerning its real course.

We mentioned in a former part of this lecture, that veins were more numerous than their correspondent arteries, and we adduced the foot as a good instance: an examination of this organ furnishes us with some facts that seem to point out the utility of this disparity in their number and size. We find that the sole and sides of the foot are parts crowded with these vessels, and we know that these parts are most of all subject to pressure, and, as a natural consequence, to obstructed circulation: this Nature has in a great measure prevented, by supplying them plentifully with veins, and those veins without valves; so that the blood may flow in every direction with equal facility. For the same reason, are many parts furnished with superficial and deep-seated veins, and others with veins with no valves: in the former case, the actions of muscles are the chief cause of pressure; in the latter, the motions of the viscera, as well as the variations of volume and site to which they are liable, have a similar effect.

There is one vein in the body whose distribution and use are so different from any other, that it requires a distinct consideration: we mean the vena portæ, a vessel formed by the union of those veins that return blood from the organs of digestion. It supplies the liver in a similar way to what arteries do other secreting organs of the body; and, like them, separates a peculiar fluid from the blood; so that, in effect, it is more properly of an arterial than a venous description.

On the Diseases of Veins.

THERE is but one disease met with in the veins of horses, and that the result of external injury: we must, however, in comformity with custom, say a few words on a supposed varix of these vessels, called

Blood-spavin.

IN the human subject, the veins of the legs now and then become *varicose;* by which is meant, a dilatation of their coats in consequence of preternatural distention: under these circumstances, the valves in them perform but imperfectly their office; the veins themselves become tortuous, bulge, and occasionally burst in various places, forming small tumors, or bloody ulcers, in the skin, which, from the appearance of the blood through them, are of a purple color. Such have many veterinary writers* conceived to be the nature of blood-spavin—a disease that has no existence but in the pages of their works. The horse, as far as our observations have gone, is not troubled with *varix;* and we much doubt that the veins of this animal have *ever* become *spontaneously varicose,* though we have none whatever, that something like varix may have been produced in them, by the remedies commonly recommended for the removal of a blood-spavin. We allude here to the use of ligature—a practice long exploded by the scientific veterinarian.

If ever you examine a horse said to have blood-spavin, (for it is by no means a very common occurrence,) you will perceive a soft fluctuating tumor upon the inner and

* BRACKEN was the first who detected the fallacy of such an opinion.

fore part of the hock, in the course of the principal vein, which is at that part superficially placed. At first view of it you are convinced from the unnatural prominence of the part, that there must be disease; and so there undoubtedly is; though it is not of that kind which its name so *emphatically* expresses. Dissection has fully developed its nature. There is placed here a little membranous bag, called a *bursa mucosa;* which contains in a natural state, a certain quantity of mucous fluid; from a too copious secretion of which, it happens, now and then, that this sac becomes distended, preternaturally enlarged, and in this condition constitutes a disease, called *bog-spavin;* the nature of which will be hereafter more fully explained. The vein, passing immediately over this bag, compressed, and diminished in calibre by enlargement of it, cannot transmit blood, at this part, with the usual facility or quickness; the consequence is, that a preternatural distention of it happens immediately below the tumid bursa, thence extending as low down as the first valve: and this has been mistaken for a varix, or some such thing, and denominated a *blood-spavin.*

A blood-spavin, then, is purely a distention* of that vein which passes superficially over the inner and fore part of the hock-joint; solely produced by, and consequently coexistent with, a bog-spavin. Be the cause of such obstruction, however, what it may, the same thing will happen: hence, if we tie this, or any other vein, we shall produce *instantly,* in truth, a blood-spavin, and probably, by allowing the ligature to continue, *in process of time,* a varix.

From what has been said about the nature of this sup-

* We would call a varix a *dilatation.*

posed disease, it is obvious that the only remedy is that of removing the cause of obstructed circulation through the vein: how this is to be attempted, will be pointed out when we come to consider a bog-spavin.

On Wounds of Veins.

It is of the ill consequences occasionally arising from the common operation of bleeding, that we are now going to treat. When the jugular vein is opened by a phleme, or lancet, and the necessary quantity of blood taken away, the edges of the cutaneous wound are brought together, and maintained in contact, by the insertion of a pin, about which is twisted a skein of common tow. Now, under ordinary circumstances, what happens in the closure of the wounded vein, is this. First, a coagulum is formed by the blood extravasated into the surrounding cellular substance, between the wound in the skin and that in the vein, by which the latter is so effectually plugged, that all further efflux is put a stop to. Then, from the lips of the orifice in the vein, in consequence of inflammation ensuing, adhesive matter is poured out; which, in the course of a few days, resembles in its texture the parietes of the vein with which it is continuous; while, in the interim, the coagulum is daily diminishing, until, at length, it is wholly removed by a process of absorption. Lastly, the new-formed membrane, occupying the site of the puncture from the lancet, is with difficulty distinguishable from the coats of the vein themselves*.

If, from the use of a bad or dirty instrument, from inexpertness in the operator, from inattention to pinning up,

* Vide an excellent paper on this subject by Mr. Travers, in the first part of the *Surgical Essays*, by Messrs. Cooper and Travers.

from subsequent friction, or, may be, from irritability of habit, any separation between the edges of the wound be permitted, so as to destroy union by adhesion, tumefaction of the neck, in the course of the vein, frequently ensues, and the horse is said to have *an inflamed neck from bleeding*. It is ever a most reprehensible practice to bleed with rusty, ill-conditioned phlemes, or lancets: both the lacerated wound they inflict, and the rust or dirt besmeared by them upon its edges, are causes which prevent union, and dispose parts to take on unhealthy action; the practices of striking phlemes with improper force, and of not holding them in a precise line with the course of the vein, are also censurable. Peculiarity of constitution has but little to do with mischief of this kind in the horse, however often it may be the source of it in the human subject. Another cause to which this accident may be referred, is that of not neatly and carefully *pinning up the neck*. For this purpose, your pin should be small, and so inserted through the lips of the cutaneous wound, that it pierce them about the centre, and take sufficient hold to prevent the probability of its being torn out. This being done, and the blood sponged from the neck, it is an excellent practice to rack the horse up, so as to confine his head, for, at least, an hour, after the operation; in which time a firm coagulum will have formed: should it happen that he has to go some distance after bleeding, this precaution may be taken with advantage, prior to feeding, even on his return home. For it sometimes happens, that horses—either from rubbing their necks after bleeding, from the pressure of the collar in draught, from friction by the rein of the bridle, or from some sudden and violent movement of the head and neck, or even from hanging the head down for long—have fresh bleeding

excited from the orifice; and this may be so profuse, as, if not arrested, to prove fatal: more commonly however the hemorrhage stops of itself, or a second pinning up is had recourse to; and it is this accident that frequently gives rise to an inflamed vein.

Inflammation occasioned by one or more of the aforementioned causes, attacks the internal, or membranous coat of the vein; and proves, if it be not soon subdued, a source of much troublesome disease in the neck; as every practitioner, who has seen these cases, is well aware of. The first appearance indicative of the approach of this disease, is the separation of the cut edges of the integuments, which are commonly redder than usual, and sometimes everted. Soon after, a little sanious discharge, at first tinged with blood, and afterwards mingled with pus, appears at the wound; the surrounding skin becomes tumefied, tight, and hard; and the vein itself, above the orifice, feels like a hard cord under the fingers in its course to the head. As the disease advances, the secretion of pus becomes more distinct, (though in some cases the serous effusion still continues,) and the tumefaction of the neck increases, accompanied with extreme tenderness, which the animal fully evinces by flinching from the least pressure. About this time, there is commonly some constitutional irritation—denoted by quickened respiration, frequent and strong pulse, refusal of food, sparing evacuations of fœces and urine, and general heat of body, more especially of the mouth. Under these circumstances, if the animal be not relieved, the head becomes enormously swollen on one side, accompanied with more or less disturbance of the sensorium; and to such an alarming height has the irritative fever in the system run, that even death itself has been

known to happen, where the case was treated from the first with all possible attention. In describing how this disease may terminate fatally, we have been recalling to mind the particulars of a case of a horse belonging to an officer of the royal artillery; where a dirty phleme had been the exciting cause; but of which, unfortunately, there were no minutes made; nor were the parts inspected after death with sufficient care, to inform us to what extent the disease had proceeded. This is the only instance of fatality in the horse with which we are acquainted, though doubtlessly there are many others: in the human subject some cases are also related which have ended in death.

We believe that this accident is more frequent among horses than men; and it has been asserted, that the difficulty of producing union by adhesion is the cause of this: when we advert, however, to the means we are compelled to use to close the wound, to the too frequent non-observance of all subsequent precautions, as well as to the untractable nature of our patient, it appears to us, that we shall find ample causes for its more frequent occurrence among horses, without ascribing it to this, which, we humbly submit, will not apply to the case before us*. If

* In the *Essay on the Wounds and Ligatures of Veins,* to which we have already, in a note, made reference, we find, as part of a communication from Mr. Coleman, the following:—"I have no doubt that inflammation of the wound *sometimes* takes place in consequence of the mode used to stop the bleeding; but I should observe *that the most simple wound through the integuments of horses is scarcely ever healed by the first intention;* and it is *this disposition to suppurate and resist adhesive union,* that is probably the most frequent cause of the external wound after bleeding not uniting by the first intention in horses, the same as in the human subject." That even a clean-cut wound through the skin of the horse, if it be ex-

it were to be referred to the insusceptibility of the horse's skin to the adhesive inflammation, instances of it must happen much oftener than they do; not only from inattention to the animal after the operation, but even under the most judicious management: which, by the bye, they seldom or never do. Let us ask any surgeon, what would be the effect of *pinning up* arms as we do the necks of horses? —and, more particularly, if his patient happened to be a maniacal one, by whom his injunctions to keep the arm at rest, and in a certain position, were altogether disregarded? Could we make use of a proper fillet, or of adhesive plaster, and impress on our patient the necessity of keeping his head and neck still, lest he disturb the wound, we will venture to assert, that we should not have to complain of the powers of healing of the skin, nor of those of any other organized part of this animal. Why have we not inflamed veins in the thigh, or the arm? If they arise from defective healing powers, these cases ought to be quite as frequent as those of the neck; whereas, they are compa-

tensive, treated in the ordinary, slovenly, careless manner, seldom heals by the first intention, we admit; but that the lips of the wound made in bleeding, unless they be afterwards separated by violence, rarely or never fail to adhere, is, to us, undeniable. Nothing is more common, in the present improved state of veterinary surgery, than to close the incisions made in performing *neurotomy*, without any suppurative process: and could we preserve the nice adjustment of the divided parts, without the employment of suture, and other irritative means, we are of opinion that adhesion would invariably ensue. These facts, with what we have advanced above, induce us to depart from the opinions contained in this citation: and we are the more anxious to express ourselves openly and intelligibly on the subject, inasmuch as we are differing (and with all deference we do so,) with Professor Coleman, on a point purely practical, and by observation alone to be decided.

ratively rare in practice—to many, unknown : and one reason appears to us self-evident ;—because they are removed out of the way of external injury.

As to the exciting cause of inflammation of the inner tunic of a vein, various opinions have been offered. Obstruction of its canal, has been adduced as one ; without foundation, however, for ligatures on the veins of horses are not attended with any inconvenience. Exposure of its cavity, has been introduced as another ; but were this the cause, we should probably have fifty, or a hundred cases, where we now have but one.

Inflammation in the vein would appear to be an extension, through continuity of substance, from that of the external wound, which always precedes, we believe, though it is not invariably followed by, it—the textures are different, but the same arteries send off vessels to both parts ; and though this will not explain *why* inflammation is excited in the vein, it may serve to point out the best means of prevention :—the effectual and speedy closure of the external wound.

We have observed, that this disease is sometimes confined to the adhesive process—a thin ichorous discharge only shewing itself at the external wound ; very commonly, however, especially if the case be neglected, or maltreated, abscess forms within the cavity, which now and then extends upwards for a considerable distance. In either case, the most common termination is the obliteration of the affected vein ; or, as it is vulgarly expressed, the *loss* of it. Every one, in the course of his practice, has met with horses *having no vein on one side.*

We shall now make mention of, and endeavour afterwards to account for, a circumstance, which, at first view, appears so singular, that it has hitherto, we believe,

baffled all attempts to explain it: *viz.* why inflammation of the jugular vein in the horse should extend itself towards the head—contrary to the course of the circulation, while the same disease in the human arm, invades the vein as it proceeds to the heart—corresponding to the passage of the blood. It appears, that although obstruction be not the exciting cause of this disease, it is that which directs the course of it when produced; for, it is our opinion, it will invariably be found to proceed in that direction in which the vein is blocked up. Let us see how this will apply to the cases before us, and, first of all, take a view of what happens in the human arm under these circumstances? It is either from the basilic, or cephalic vein, (two superficial venous trunks at the bend of the elbow,) that surgeons draw blood; which veins freely communicate with others, particularly the deep-seated, just below the part commonly punctured: in the event, therefore, of its canal, near the orifice, being obstructed, the vein will not be choked up below, in consequence of the free anastomosis existing between it and the contiguous trunks; in which the unimpeded circulation will preserve a continual flow of blood up to the obliterated part. But above the orifice no vessels of communication are found, nor can the blood take a retrograde course from the axilla; consequently, there is nothing to prevent that portion of it—that contained in the upper part of the vein, from forming a clot. From the human arm let us advert to the horse's neck. It is from the jugular vein (the internal jugular of the human subject) that we extract blood commonly in the horse; a vein of large size, and the only one, with the exception of the vertebral, which returns the blood from the head and neck: the horse has no external jugular vein. If, then,

this vein be obliterated at the part we bleed, whether is the upper or the lower portion of it more liable to obstruction?—to the formation of a coagulum? The lower part will not, for, having once emptied itself, (and this it will do probably even by gravitation,) no fresh supply of blood can be sent to it: but the upper, on the contrary, being full, must remain so; there being no communicating channels by which the blood can be carried off. Here, then, we have an exception to the principle laid down by surgeons, relative to this accident: *viz. that obliteration is always found next to the heart.* Knowing that the same cause, under the same circumstances, will always produce the same effect, we would resolve this apparent anomaly in the laws of the animal economy, by saying, *the same cause is operating under different circumstances.*

Subsequent inquiry and experiment have fully borne us out in this solution of a mystery, apparently the more abstruse the more it was investigated by the laws of pathology; for we are ready to confess, that our theory was framed before our hands were busied in experiment. It naturally suggested itself, that, if our explanation was correct, other veins similar in their distribution and communication to the cephalic or basilic of the human subject, when inflamed, would swell towards the heart. Reference to our own cases proved the fact, and subsequent inquiries among our friends have corroborated it: both the saphena and *plate* veins of the horse, when inflamed, tumefy upwards; and the reasons are obvious—they need not repetition*.

* The rarity of these cases, and the interest this question has excited in the profession, induced us to follow up our inquiry by

The mode of treatment found to be most successful by veterinary practitioners, is, in some respects, very different from what surgeons are in the habit of adopting. If the tumefaction and induration, in the course of the vein, have extended to the head, a blister is by far the best application, without any regard to fomentations, evaporating lotions, &c. which are only of use in the more incipient stages. At the same time, you should produce a slough, and excite the adhesive action in the vein, by the introduction of some caustic, or of the actual cautery: the latter is by far the preferable remedy. In the use of it we avoid all force—the mere searing of the sides of the wound is all that is required; our objects being to pro-

the still less fallacious test of experiment. It was proposed, that these and other veins should be inflamed by irritation—in fact, that they should be placed, as nearly as possible, under the same circumstances as the jugular, when so affected from the cut of the phleme. We found it somewhat difficult to induce a suppurative condition of these veins, though we employed for the purpose rusty lancets, escharotics of various kinds, ligatures, and frequent separation and friction of the external wound; but, perhaps, some of these means in another case, (for we have not had an opportunity of repeating our experiments) might succeed. An intimate friend of ours, Mr. Cherry, Veterinary Surgeon at Clapham, to whom we had communicated our ideas on this subject, made several attempts to inflame the inner tunic of veins by passing pack-threads through them; but in no one instance did he succeed—the ligatures, on the fifth day, were ulcerating their way out, and the interior of the veins presented no change but a very slight thickening of the lining membrane: there was no blush whatever perceptible. The results of these experiments, which, we must confess, were by no means so satisfactory as we could wish, favored our theory: we would rather that others should pursue some such tract of investigation however, than hastily receive that which is still matter of debate.

cure a free opening, and a discharge of healthy pus. The introduction of the cautery, without the application of a previous or accompanying blister, we have frequently observed to be followed by aggravation of the disease—arresting the discharge, and thereby considerably augmenting the tumefaction: we, therefore, seldom or never separate the cautery from the blister, though the latter may, in course, often be made use of without the iron. Could we extract blood from the part itself, much benefit, doubtlessly, would ensue; but it is rarely necessary to draw it from the system, unless the constitutional irritation run high. Purgatives in full doses are always proper; and the substitution of bran for corn is a good regimen. There is one circumstance regarding the treatment of inflamed necks, which is not held in proper estimation by the majority of practitioners; and that is, the *position* and *motion* of the head and neck: by keeping the head constantly elevated, and as immoveable as is compatible with the habits of the animal, we contribute *much* towards the abatement of the existing inflammation.

LECTURE VII.

On the Absorbents.

THERE is a vascular system in an animal body, which, from a knowledge of its being employed in absorbing, or taking up substances, anatomists have called the *absorbent:* it is altogether distinct from the arterial and venous systems, though it differs from them, as we shall hereafter learn, more in regard to its economy than its structure. The absorbent vessels are, comparatively speaking, of late discovery; if we take into our calculation their general distribution, and extensive use in the animal constitution.

These vessels were formerly supposed to be of two different kinds; hence they received the names of *lacteals* and *lymphatics:* appellations that have not been laid aside, though more recent experiments have shown, that there exists no real distinction between them, either in relation to structure, or function. The lacteals were *first* discovered. They were seen, first of all, upon the surface of the viscera of the abdomen, in animals opened soon after a full meal, containing a fluid similar to milk in its appearance: a circumstance implied in their name. Not long after, others of a similar description were found

in various parts of the body; which, from being filled with a thin, transparent, watery fluid—lymph, received the name of *lymphatics*. These vessels are now divided, according to their relative situation, into *superficial* and *deep-seated* absorbents: the former are plentifully distributed under the skin, and pierce it in prodigious numbers; the latter are commonly found accompanying the principal blood-vessels.

The absorbents have but one principal trunk, called the thoracic duct; which takes its course along the inferior part of the spine, within the cavity of the thorax, and terminates in the left jugular vein, near its junction with the axillary: by it, all the absorbed fluids are received, and poured into the circulating mass.

The absorbents, generally speaking, run in company with the principal veins, according as they are superficially or deeply placed; though, unlike them, they take a singularly tortuous course: if, therefore, we wish to find these tubes for the purpose of injecting them, we ought always to be guided in our search by the situation of the venous trunks. Hence, we know, in farcy, (a disease of the superficial absorbents,) that buds are commonly perceived upon the inside of the thighs, and may be traced in the direction of the vein from which we bleed. In their passage, the branches conjoin their canals, so as to form a set of tubes, less numerous, but of greater individual diameter; whose united area grows smaller as we approach the thoracic duct: by which construction, the course of the contained fluid is much accelerated. These vessels do not ramify alike in all parts; in some, they exhibit an arborescent appearance: *e.g.* the ramifications of the lacteals within the folds of the mesentery, much resemble the branches of a tree; in others, they form a

sort of network in their distribution: *e.g.* upon the surfaces of the lungs and liver.

Like the blood-vessels, the absorbents anastomose in every part of the body; in consequence of which, the passage of fluids through them is much facilitated, and all obstructions rendered harmless so long as any of the communicating branches remain pervious. Indeed, so provident has Nature been in regard to this principle of anastomosis, that an obliteration of the thoracic duct itself, would not necessarily prove destructive to life; for Mr. CRUIKSHANK has demonstrated a communication between the lacteals and lymphatics, by which the chyle might still be conveyed into the circulating mass. According to this writer, anastomosis takes place not only between the smaller branches, but between the larger trunks, and even the glands themselves.

In all animals, the structure of which has been examined, we believe that absorbents exist; they are found, however, in greater abundance in some parts of the body, of the same animal, than in others: this appears to be the case in the mesentery, lungs, and liver; while none have hitherto been discovered in the brain, though, from what we know of the composition and economy of that organ, we have no reason to doubt their presence there. If we believe that a fluid is continually poured into the lateral ventricles, we must admit that absorbents exist in order to prevent its accumulation: an effect never met with in health, though it occasionally happens in disease. Mr. CRUIKSHANK, who has bestowed much pains in the compilation of his work on the *Anatomy of the Absorbing Vessels of the Human Body*, says, that " the lacteals are three if not four times more numerous than the arteries and veins," and, that " in the extremities of the human body,

the superficial lymphatics are vastly more numerous than the cutaneous veins—fourteen trunks frequently accompanying one cutaneous vein:" and further, that "the deep-seated lymphatics are at least double the number of the arteries they attend."

The absorbents arise from five different sources. First, they proceed from the interior of the villous coat of the intestines. To be satisfied of this mode of origin, we have only to kill an animal about three or four hours after a copious meal, and lay open the abdominal cavity; and we shall perceive the mesentery streaked with numerous white lines, which may be traced into as many small white specks upon the inner surface of the intestines; which specks, or spots, are the mouths of so many lacteals. If the parts are dissected, and steeped in spirits of wine, the chyle in the lacteals becomes inspissated: so that, in this way, you may make a very elegant preparation of them, and examine them with much more facility. From the microscopical observations of Mr. Cruikshank, and others, it appears that these vessels arise by small orifices belonging to short radiated branches; and that many of these unite to form one absorbent trunk—one lacteal.

The second mode of origin is that from the interstices of the cellular membrane, or rather, from the interior of its cells: by throwing quicksilver into them, in some parts, the absorbents become immediately injected—as is the case when any is poured between the membranous envelopes of the testicle. In addition to this proof, however, we infer their existence in the cellular membrane from a well known fact, which could not otherwise be satisfactorily explained. We mentioned, when on the arteries, that many of their minute branches were called *exhalents,* in consequence of emitting, in the form of

vapour, an aqueous fluid into the cellular membrane; and that, although this secretion was constantly going on, there was no accumulation of it, excepting under some circumstances connected with disease. It is evident, therefore, that there must be a proportionate absorption; and we know of no other means by which such a process can be effected, but by the mouths of these minute vessels.

The third source from which they spring, is the large cavities of the body: *viz.* those of the belly, head, and chest: in them, there is also an exhalation from the extremities of the arteries, which requires to be continually imbibed by those of the absorbents. Fluids injected into the bellies of living animals, are soon afterwards imbibed by these vessels, in which *alone* they have always been detected: Mr. CRUIKSHANK says, that "of six pints of warm water (thrown into the belly of a dog) after six hours not more than four ounces remained."

The fourth place of origin is from the surface of the skin; of which we have demonstration from injection, as well as ample proof deduced from various phenomena exhibited in the economy of this part. If an injecting pipe be inserted under the cuticle, or scarf skin, of the scrotum, and the quicksilver be allowed to extravasate, numbers of these vessels will be filled: independently of this however, were it not for the presence of absorbents, how could we explain the operation of mercurial ointment; which, we know, when rubbed upon the skin of the human subject, will produce the same effects as if it had been taken into the stomach? We shall have occasion to illustrate this more fully, in treating of the physiology of these vessels.

The fifth and last origin, is that from the interior of an

excretory duct*: where they appear to have been distributed for the purpose of preventing the duct from bursting, by relieving the distention it is occasionally subject to, from some obstruction in its canal. When this happens in the hepatic duct, bile is absorbed into the system, giving that yellowness to many parts of the body, seen in the disease called jaundice; for it has been found by experiment, that if the duct of the liver be tied, the absorbents of that organ become shortly afterwards filled with bile; and any pressure on it, or other cause of obstruction, would of course have a similar effect.

Some make mention of a sixth origin of the absorbents:—from the extremities of arteries; which they instance by saying, that if you throw quicksilver into the spermatic artery, it will fill the absorbents of the cord: this is certainly true—we have preparations demonstrative of it, but it is an event most probably referable to *extravasation* of the metalic injection; for, as we have just stated, if mercury be simply thrown under the membranous coverings of the testicle, (without seeking for vessels underneath,) the absorbents will be as completely injected, as if we had inserted the pipe into one of their ramifications. After all, however, that has been said about the different modes of origin of the lymphatics, we are compelled to acknowledge, that their orifices have never been seen: in consequence of their extreme minuteness, as well as from the transparency of the fluid they contain, they have hitherto eluded the observation of our most diligent anatomists—they are supposed to be similar to those of the lacteals.

* A tube, by means of which, the secretion of a gland is conveyed into the organ destined for its reception.

The principal termination of these vessels is in the thoracic duct; which, we before mentioned, was to be considered as the trunk of the absorbent system. It is placed beneath the spine, commencing in its lumbar region, where it is formed by the junction of three large absorbent vessels:—one of which is the main trunk of the lacteals; the others are branches of considerable size, formed by the union of absorbents coming from either of the hind extremities. The thoracic duct at its origin is somewhat larger than elsewhere, which dilated portion of it has received the name of *receptaculum chyli:* in its course along the spine, it is first placed to the right, and then to the left side of the aorta, and ultimately ends in the left jugular vein, near its junction with the axillary. There is on the opposite side of the neck an absorbent trunk, of comparatively small size however, in which the absorbents from the right side of the head and neck, and from the off fore extremity terminate: this empties itself into the right jugular vein.

It is thought, that an absorbent has three coats:—an elastic, a muscular, and an internal or membranous; but these tunics are so extremely thin and pellucid that they cannot be separately demonstrated. If you distend one of these vessels with quicksilver, and then make an opening into it, the metallic injection will be ejected with such a degree of force as to lead you to suspect that the vessel must have contracted, or it could not so suddenly have emptied itself, and recovered its original calibre: and it is evident, that to elasticity alone can be ascribed such a contractile power in the dead body.

Anatomists, in general, believe that these vessels have a muscular coat, though they rather infer its existence from the well-known functions that they perform, than

from any proofs of its presence afforded by dissection: some however assert that they have seen fibres, closely resembling muscular, in the thoracic duct of the horse, which vessel, they tell us, possesses contractile powers; and if this be true, we may fairly conclude, that its numerous ramifications are similar to it; though their minuteness and the semi-pellucid nature of their coats, render it perhaps impossible for us to detect any distinct arrangement of fibres. One of the best arguments in favor of their muscularity, is the degree of irritability they are said to shew on the application of stimuli to them: *e.g.* if an absorbent be touched, either in the living or recently dead animal, with any stimulant, it will be seen to contract on its contents, in the same way that muscular fibres are known to do; or if a lacteal be emptied by puncturing it, or by making pressure upon it, it will be immediately filled again; and, to all appearances, from the impulsion of fluid into it by the communicating ramifications.

Like arteries and veins, the absorbents possess an internal coat, but it appears to be one of a much denser and stronger texture; for, in injecting these vessels, you will find that a single trunk will of itself support a very heavy column of quicksilver, and that the vessel will still contain the metal, though the exterior coat be cut through.

Valves are exceedingly numerous in this system of vessels; though they are very irregularly placed, being found in some absorbents in great numbers, while in others they are comparatively scarce. We observed, when on the veins, that, according to the opinion of Mr. Hunter, the valves in them were not to be regarded as continuations of the lining membrane, and Mr. Cruikshank, we find, thinks, that they differ in structure from it in the absorbents: he says, in allusion to this part of our subject,

"It never struck me as a good argument, that because one substance was seemingly continued from, or went into another, it was therefore the same kind of substance." These valves are situated in pairs, and we not unfrequently find three or even four pairs within the space of an inch: there are no absorbents without them. If you examine a distended absorbent, you perceive that it is knotty, or irregular in its canal: this appearance is owing to the valves, which are placed in pairs at every joint, or contracted part of the vessel. The small abscesses in farcy assume that remarkable appearance called *buds,* in consequence of the valves intercepting the diseased portions of these tubes*.

The valves perform the same office in absorbents as they do in veins: *viz.* that of preventing any retrogade motion of the circulating fluids, and, it is thought, that of sustaining in part the weight of their column, by frequently intercepting it. In support of this hypothesis, Mr. Cruikshank says, "that the thoracic duct in horses has few valves, compared with the same duct in monkeys, where it is quite crowded with them:" but by subsequent researches into comparative anatomy, he was by no means well borne out in this opinion.

Absorbents have their vasa vasorum. The above writer mentions, that he has injected in quadrupeds the arteries on the coats of the lymphatic vessels, and seen them ramifying very elegantly through their substance; and he goes on to say, "these arteries must have their corresponding veins, and I can have no doubt of their being at-

* The valves do not appear to be diseased in farcy, when the lining membrane presents a surface of ulceration: another, and to us a conclusive proof, of the difference of texture of these parts.

tended with lymphatics." Without taking the trouble, however, of attempting to inject these vessels, we can frequently demonstrate their vascularity, when they are in a state of disease—as in the inflammatory stage of farcy prior to suppuration: hence we find, that they in no wise differ in this respect from arteries and veins.

Nerves also, in all probability, enter into the texture of an absorbent; for we are informed by the same writer, that the thoracic duct is surrounded by nervous filaments. It would appear, however, from some experiments relating to absorption, that these vessels can perform their action without the nervous energy.

On the Absorbent Glands.

SMALL glandular looking bodies are found in various parts of the body, commonly looked upon as appendages to this class of vessels—as forming a part of the absorbent system, with which they are so generally connected. Though these organs are called *glands,* we have no reason for considering them as such: indeed, much doubt is still entertained by anatomists as to the real nature and use of them.

They are commonly of an oval figure; and vary in size, from the bulk of a small pea to that of a walnut. There are very many of these glands in the mesentery, through which the lacteals are passing: also in the loins, upon the inside of the thighs, in the breast, and under the jaws, every practitioner knows, that the kernels, as they are called, in farcy, are occasionally found. These glands are for the most part of a reddish color in their substance; though, in exception to this, there are a few at the roots of the lungs which put on a dark blue, and sometimes black appearance. From the number of these small bodies in various parts, the circulation in the absorbent sys-

tem is not likely to be much impeded by obstruction of one, or even a cluster of them; for, as many have no immediate communication, morbific virus commonly affects but a limited number of them.

The lymphatic glands are enveloped in separate capsules, loosely connected to the surrounding parts by cellular membrane. We do not know precisely in what the minute structure of a lymphatic gland consists; though the opinion of its being cellular—*i. e.* made up of small cavities, or cells, seems to be the best received among modern anatomists. Mr. CRUIKSHANK observes, that "In quadrupeds it is very easy to demonstrate the cellular structure: both in *asses* and *horses*, the glands on the mesentery are most distinctly cellular:" many of these cells communicate one with another. An absorbent, prior to piercing the substance of one of them, divides itself into several branches, called vasa inferentia, from the circumstance of their dipping into, and terminating in, these cells, into which they are supposed to deposit their contents. Other similar ramifications, arising from the opposite sides of them, by which the fluids are again taken up, have received the name of vasa efferentia. To these, by some, a third set has been added under the appellation of vasa circuita, which pass over the exterior of the gland without having any communication with its cells: these vessels (if such exist) appear to be useful in giving passage to the fluids into other glands, in case of any obstruction in that over which they ramify.

The lymphatic glands are very vascular—they possess numerous arteries with corresponding veins, which latter vessels are without valves*. It appears that their nerves are of very small size, and but few in number.

* Vide CRUIKSHANK, *on the Absorbing Vessels of the Human Body.*

LECTURE VIII.

On the Physiology of the Absorbents.

ABSORPTION was formerly supposed to be a process carried on by the veins, to which the absorbents themselves were regarded as appendages; an opinion that maintained celebrity until the time of Mr. JOHN HUNTER: he it was that first proved, by many ingenious and well-conducted experiments, that this function was principally, if not entirely, performed by the absorbent system. He first demonstrated, that the lacteals, and not the mesenteric veins, absorbed and conveyed certain fluids from the cavity of the intestines into the circulation. By injecting milk, and other fluids colored and scented with various substances, into the bowels of an animal, he found that the lacteals were uniformly filled with them; while, on the other hand, the mesenteric veins either remained empty, if the circulation was stopped in them by tying the mesenteric arteries, or contained blood, when no ligatures were used, which exhibited no tests whatever of any admixture of the injected fluids.

With regard to the economy of the lymphatics, although we cannot demonstrate their functions with equal certitude by experiment, we may infer it to be similar to that

of the lacteals, from the many phenomena relative to the healthy and morbid actions of the body, which we could on no other principle than that of a process of absorption, satisfactorily explain. We said, in the foregoing lecture, that the lymphatics arose from every part of the body, and that their trunks were more numerous than those of the arteries and veins taken collectively; we have no right, therefore, to argue from their minuteness, their incapability of performing the functions ascribed to them.

Mr. Hunter, to whose labors we are indebted for much information on this subject, was first induced to believe that absorption was performed by the lymphatic vessels, from an attentive observance of different facts connected with disease, which he found inexplicable on the, then, more current opinion of the veins being the channels of absorption. This acute physiologist first remarked, that poisons, said to be absorbed and conveyed into the circulating medium by the veins, did not take the course of those vessels, but, on the contrary, might be traced along that of the lymphatics. The venereal virus, for example, which is commonly absorbed from the glans penis, produces effects in the groin, by creating irritation in the absorbent glands there; and they, in consequence, swell, become hard and painful, and form, what is called, a *buboe*. Now, this is not the course of the veins, but of the absorbents; which indeed may frequently in this disease be felt, or even seen, running along the dorsum penis into the glands in the groin: and that these vessels are not veins, but absorbents, may be proved by the fact, that if the swollen glands be extirpated before the poison has passed beyond them, the disease will be as effectually eradicated, as if the specific itself had been administered. Again, if a horse be innoculated with glandered

matter in the nose, in the course of three or four days an ulcer will be seen at the place of innoculation, accompanied with one or more small tumors under the jaw: in this instance, although the disease appears to take the course of the superficial veins, dissection has demonstrated that those vessels are in a state of health, and that it is the lymphatics alone, with the glands in which they terminate, that are affected. From a consideration of the above facts then, it appears undeniable, that these vessels are, as their name imports, the channels of absorption; and that no such function can be assigned to the veins, as far, at least, as the actual inspection of parts warrants such an assertion: still it is right to remark, that there are writers of the present day who think that the veins participate in this process.

In some instances, the virus conveyed by these vessels and poured into the blood, contaminates the whole circulating mass: the experiment we related when on the blood, relative to transfusion, seems to put this opinion out of the reach of doubt.

The absorbents not only possess a power of imbibing fluids, but even of taking up the hardest solids themselves, of which we see daily examples in the disappearance of bony tumors: exostoses, in the form of splints, spavins, and ringbones, are removed, on this principle, by the effect of blisters; and strangles we have all seen, prior to suppuration, give way to absorption. But another and more striking instance, is the removal of extravasated blood: if a man gets a black eye, which is nothing more than an effusion of blood under the skin in consequence of a rupture of some small blood-vessels, we know that the swelling will gradually diminish, and slowly lose its black or blue tinge, until, at length, the part resumes

(and it does so by a process of absorption) its natural size and appearance. Parts of the body that have lost their vitality, are detached and thrown off in the form of sloughs by an act of absorption : these vessels erode, as it were, such particles of living matter as are in immediate contact with the dead, and the latter is ultimately cast off by granulations, which spring up from the living surface underneath. It has been observed, that new or recently formed parts are absorbed with more readiness than old.

On no other principle than that of absorption, can we explain the well-known action of mercurial ointment rubbed upon the surface of the human skin ; the constitutional effects of which are nearly the same as if so much had been actually introduced into the stomach; though, in the one case, it is carried into the system by the lymphatics; in the other, by the lacteals. We have made some trials of mercurial inunction on the skin of the horse, where it is uncovered by hair, but we have never been able to produce salivation, without the aid of the internal exhibition of some preparation of mercury; and calomel is the most effectual for this purpose. Tartar emetic also, a very small quantity of which will vomit a man when taken, has a similar effect on him by inunction.

Physiologists had no sooner ascertained that the process of absorption was the function of these vessels, than other inquiries were instituted to learn by what means solid matters were removed and conveyed by them into the circulation. Various conjectures have been formed on this curious process : some imagining that they had teeth, for the purpose of comminuting or breaking down the solids; while others thought that capillary attraction, or suction, was the power by which this extraordinary function was performed. Others, with more

plausibility, offer as their opinion, that all solid matters are dissolved, or reduced to a state of fluid, prior to the absorption of them: bone, for example, say they, prior to its being absorbed, is dissolved by the phosphoric acid contained in the blood; this opinion however, like the preceding, is purely hypothetical, nor indeed do we at present know how the process is effectuated.

It would appear, from some facts, that the orifices of these vessels possessed something like the power of selection: *e.g.* poisons, generally speaking, will not be taken up by them, unless the surface of the skin be abraded. You may besmear any part of the skin with the matter of farcy and glanders without infecting the animal; and we have several times rubbed it upon the pituitary membrane without contagion: but if you produce the least abrasion of the surface, the absorbents almost invariably imbibe the virus. Again, the lacteals have other fluids than chyle presented to their mouths; both bile and pancreatic juice flow over their orifices, and yet these fluids are never detected in their canals.

It is now well known, that absorbent vessels will take up gases in contact with the surface of the body, though doubt still exists as to the absorption of fluids: hence mercurial fumigation in the human subject causes salivation, and yet it appears that mercury in a state of solution in water will not produce it. A similar result has been observed from some experiments made with spirits of turpentine: if the hand be immersed in this fluid, and care be taken not to inhale its fumes, no absorption of it appears to happen; but let a person inhale the vapors of it, and its presence can be demonstrated in the urine, with as much certainty as if it had been introduced into the system through the medium of the alimentary canal. It

still remains to be decided, and it is a question replete with interest to the veterinary surgeon, whether we have any *infectious* disease in the horse—any that may be communicated by the inhalation and absorption of noxious vapors: we know, that glanders and farcy are *contagious*, but whether we can pronounce them to be communicable by the breath, or susceptible of being engendered by a polluted atmosphere, seems as yet undetermined: at least, we believe, that we shall find advocates both *pro* and *contra*.

With a view of ascertaining whether nutriment could be supplied to the system by means of the absorbent powers of the skin, emaciated persons, labouring under disease of the organs of deglutition, having been first accurately weighed, have been put into baths consisting of nutritious fluids of various kinds, such as milk and soup: these patients however derived no benefit from the experiment, nor did they receive any augmentation of weight but what was satisfactorily accounted for without any reference to absorption. Under such circumstances, however, although the lymphatic vessels refuse to take up nutriment presented to them in the form of extraneous matter, they are actually nourishing the body—by conveying its adeps into the blood: hence the cause of the extreme emaciation of these people is explained, as well as the sustenance which the body appears to receive (for it essentially does not) from the very sparing quantity of the ingesta. And now that we know why extreme pain long continued, or any other cause of defective appetite, should throw an animal so rapidly out of condition, and leave him so debilitated, we shall not feel surprised at a horse, who has simply *picked up* a nail in the foot, wasting away in flesh, however fat he might previously have

been; for the pain caused by this accident is often so excruciating, that not only does all desire for food leave him, but even death itself occasionally ensues.

The matter absorbed, having once entered the orifices of these tubes, is propelled, it is supposed, by the action of the muscular tunic, through their various ramifications into the receptaculum chyli, where a commixture of the chyle, from the lacteals, and lymph, from the lymphatics, takes place; which fluids are, in union, poured by the thoracic duct into the left jugular vein, to be circulated with the general mass of blood. It is not improbable, that the passage of the absorbed fluids is somewhat assisted by the occasional pressure to which these vessels are subjected, in almost all parts of the body.

The lymphatics, like the arteries, are constantly in action, but their function, as we have seen, is very different; for they are removing the various materials of which the body is composed, and re-conveying them into the blood, from which they were originally formed: hence the latter vessels have, and not inaptly, been regarded as a set of workmen employed in depositing new materials, while the absorbents have been compared to others who are clearing away the rubbish and worn-out parts, and carrying them back to the general elaboratory; where they are either decompounded, and in part again rendered fit to serve some purpose in the animal economy, or cast off altogether as excrementitious. This change is continually, and almost imperceptibly, going on in every animal body; but the processes of deposition and absorption do not bear the same relative ratio at all ages: in the young animal, for instance, in which the body has not attained its full growth, the arteries deposit more than the absorbents remove, hence the increase of every

part is accounted for; but at the time of puberty, when an animal has arrived at perfection of growth, these two orders of vessels are nicely balancing their operations; while in old age that of the absorbents predominates, and the animal experiences a gradual decay of the powers of his constitution. We are to consider the lymphatics, therefore, as the means of removing that which is superfluous or noxious, and the lacteals, as the channels for the conveyance of nutriment; at the same time, however, that these vessels serve such important ends in the system, they sometimes prove, as we shall hereafter explain, the vehicle of its infection, and even, now and then, of its destruction.

We have various means of exciting the action of the absorbents. Many medicines are employed for this purpose; some of which appear to possess a specific action over them, while others operate through the medium of the excretories of the system. In the human subject, one of the most powerful is mercury, employed in various forms: to such an alarming extent, indeed, may this remedy be carried, that the gums will ulcerate, or be absorbed, and the teeth loose and drop out, from its influence: and even the jaw-bone itself has been known to become carious during its improper administration. Hence, one of the most ready means surgeons possess of dispersing a tumor, is the inunction of it with mercurial ointment; and in this case, the medicine has little or no local effect, but produces absorbtion *principally* from its influence on the absorbent system.

Strong diuretic and purgative medicines increase the action of the absorbents; for under their operation, it appears that these vessels are excited to do more than ordinarily, in order to repair the losses sustained by the

constitution during the continuance of such evacuations: hence it is, that these are among the best remedies we can employ in dropsical affections. How often do we see swelling of the legs removed by a dose of physic, or the use of a few diuretic balls; and a similar effect is well observed in watery farcy, in which strong doses of aloes and calomel, combined with diuretics, are the most ready and efficacious means we can adopt to reduce that enormous tumefaction of the limbs, so alarming a symptom in this disease.

Exercise, while it accelerates and strengthens the circulation of the blood, proves a stimulus to the absorbent vessels; of which we have ample proof in the diseases above mentioned, not to notice the numberless instances we have of it, more particularly in the autumnal season of the year, in horses whose legs are *filled* in the morning, but become *fine* as soon as they have been walked out for a short time.

Friction also tends to promote absorbtion. Merely hand-rubbing the legs will frequently reduce common dropsical accumulations in them; indeed, it seems to have the same effect as gentle exercise has—accelerating the circulation, facilitating the return of blood through the veins, and, at the same time, increasing the action of the absorbents. In the human subject, mercury, but a short time ago, was almost always introduced into the system, for the cure of the venereal disease, through the medium of the absorbents of the skin: in this case, friction is necessary to impel the ointment through the pores of the cuticle, at the same time that it rouses these vessels into action. In some instances, pressure alone will effect a diminution in the size of a swollen part: hence, the constant application of a tight bandage

to an enlarged leg, will often reduce it; and with the same view, some old practitioners recommend that sheet-lead be bound tightly upon the leg for the removal of splints.

In the human subject, digitalis, when internally administered, both from its nauseant and diuretic effects, proves a stimulus to these vessels: we are not prepared to say whether its use be attended with similar good effects in the horse.

Absorption is augmented by the application of stimulants to the surface of the skin: this fact is best shown in the use of blisters to those kinds of tumors we are not able to discuss by other means: need we mention windgalls, and a variety of exostoses. Now let it be observed here, that the first effect of a blister is to excite the action of the arteries, so that the swollen part is rendered absolutely larger than it was before; but its ultimate one is to provoke that of the absorbents, which immediately set about the removal of the swelling.

Heat, whether it be combined with moisture or not, will cause absorption; though its *modus operandi* appears to be different according to the means which we employ in its application, as fomentation and the actual cautery plainly show us.

Physiologists are not agreed as to the use of the absorbent glands in the animal economy. It has been supposed, that the lymph, in passing through them, experiences a more perfect union, or combination of its elements, or, in other words, undergoes a process of assimilation, or animalization, and that this renders it fit for commixture with the general mass of blood: the fact of the venereal virus in the human subject, although conta-

gious if taken from a chancre, being quite innocuous when obtained from an ulcer in the throat, is advanced in support of this hypothesis; it may be urged, however, against it, that there are some substances which do not appear to undergo any change in their passage into the system.

On the Diseases of the Absorbents.

The absorbent vessels, and their glands, are liable to become inflamed from two causes:—from simple irritation, and from the external application of various poisons. In horses, they are seldom diseased from the first cause, though we have seen them thus affected: if, for example, any irritant of an active nature, be applied to the membrane lining the nose, so as to cause some corrosion of its surface, you will have corded absorbents and tumefied submaxillary glands, the effects of ulceration in the nostrils, putting on altogether the appearance of glanders; but differing essentially from that disease, inasmuch as it will soon subside from the use of common depletive remedies. In the human subject, this kind of irritation is very common, in consequence of these vessels being much more susceptible of injury than in horses: merely tying the shoe too tight, will not very unfrequently disease the whole limb, by inflaming the absorbents; which appear like so many red lines upon the surface of the skin, taking their direction to the groin, where the absorbent glands, called the inguinal, are also commonly enlarged. In men, they inflame less frequently from the absorption of poison than from common irritation;—not so in horses; in them, the introduction of poisonous matter into the system, is the chief source of disease

of the absorbents, and their glands; of which we have, but too frequently, fatal instances in the destructive ravages of glanders and farcy.

We might, *a priori*, have supposed, that these vessels were diseased, at least in function, in all cases of dropsical accumulation; otherwise, the fluid would have been taken up by them in the same ratio in which it was effused by the arteries; far from being owing to defective absorption however, these vessels are actually enlarged in their calibre under such circumstances, and have, in reality, been performing more than they ordinarily do. The chief cause of this disease appears to be increased action, combined with diminished power in the circulating agents—the heart and arteries; by which more blood is thrown into the capillaries than can be returned by the veins. Bleeding, therefore, in such affections, is generally a good practice, as it tends to abate the quickness of the pulse, at the same time that we are making use of the remedies before enumerated, to rouse the absorbents into still greater action. But in farcy, which is a disease of the absorbents themselves, the dropsy commonly attendant, is probably owing to defective absorption, in consequence of obstruction in these tubes.

The absorbent glands of the mesentery are by no means unfrequently diseased: indeed so common is this disease in the ass species, that we meet with it often in apparent good health. There is an affection of the same nature to which scrofulous children are very subject; in whom it is known to be present during life, by preternatural enlargement, tension, and hardness of the belly, accompanied with more or less disorder of the bowels, and marks of general ill health. Here we might conclude our remarks on this hitherto uninvestigated

subject; had not an extensive range of practice afforded us opportunities of deviating from the trodden path of generalization, and of coming to something determinate about a disease, with which we have only been made analogically acquainted.

In almost all the cases we have met with, (and they have been pretty numerous,) in which dissection has shown *general* disease of these parts, *loss of condition* has been a marked and uniform symptom during life, accompanied with some perceptible change in the appearance of the excrement—though this may be only occasional—and with more or less irregularity in the discharge of it. These symptoms, which may be said to constitute the first stage, are succeeded by others not less characteristic of a disease, that, if it be extensive, and the horse young, is not unlikely to end in death. Irritation of bowel supervenes, probably giving rise to a dull and heavy pain, so that the horse lies down during most part of the day, manifests considerable depression of spirits, loses his appetite, and continues to fall away: about this time his pulse becomes frequent—we have known it to rise to 100°—his breathing is in some degree quickened, and other signs of constitutional disturbance are present. The case is now alarming—the practitioner is *ignorant of its nature*—and the animal unrelieved, dies in a state of extreme emaciation. Seeing, then, that this is the common course of a malady we have not devoted that attention to which, every one who has his profession at heart will coincide with us, we *ought* to have done, we shall conclude this lecture by admonishing veterinary practitioners against inattention to diseases denominated *chronic;* of which this is one of the most important*.

* These glands, when diseased, are met with in a variety of

LECTURE IX.

On Cellular Membrane.

CELLULAR membrane is the general connecting medium, if not a constituent, of every part of the body.

states. The common appearance is what is called *schirrus;* but even this is extremely variable, as to the precise nature of the change the gland has undergone. Without any attempt to trace the progress of this and other morbid changes, much less to couple them with their diagnostic symptoms, which present medical science, even in the human subject, does not admit of, we subjoin descriptions of several specimens of this disease now in our museum.

No. 2. A cluster of mesenteric glands, having a lobulated appearance, attached by a loose fold of mesentery to the duodenum. Altogether they are about the size of a hen's egg, firm and solid throughout, and exhibit a yellowish inorganic texture within: all the glands connected with the small intestines were similarly diseased. The case was fatal.

3. A mesenteric gland enlarged and schirrous. The change this has undergone, is of a scrofulous nature: its central part contained a curdly cheesy matter, such as is found in parts so diseased in the human subject.

94. Several *cancerous* mesenteric glands, belonging to the large intestines. They contained considerable collections of curdled pus, which, by ulceration, had discharged itself into the gut. Death ensued.

By it the coats of arteries and veins are knitted together, as well as loosely connected to the surrounding parts; and these vessels, together with almost all other parts, are found to possess much of it in their ultimate composition. The various membranes of the body, by maceration, or boiling, may be entirely resolved into cellular membrane; though it exists in them in so dense and compact a form, that its general character is much altered: even bones themselves, by being long steeped in diluted muriatic acid, may be converted into a soft substance, which appears to be chiefly cellular membrane; and we know, that it unites the minutest *fibrillæ* of muscles, so as to form *fasciculi*, and by continued union of them, a complete muscle.

There are two kinds of cellular membrane in the body: —one, from its net-like tissue, is called the *reticular;* the other, from containing *adeps* or fat, the *adipose.* We shall first speak of the reticular membrane.

The reticular membrane varies somewhat in its quan-

116. Specimens of two schirrous mesenteric glands of very large size: when taken from the horse, each weighed 14 lbs. Internally they consist chiefly of schirrous deposit; an unhealthy-looking pus was discharged from them in some places; and here and there are depositions of bone. Their peritoneal covering is considerably thickened, indurated, and altogether altered in texture: it may, in some parts, be with propriety called *cartilaginous.* The case proved fatal.

151. Thickened and tuberculated mesentery, with cancerous glands. In the subject from which this preparation was taken, the mesentery and its glands presented a sheet of scrofulous disease. Some of the glands were in an enlarged and schirrous state; others contained a curdled and bloody pus; in addition to which the mesentery itself was studded with hard, white, solid tubercles. This case ended in death.

tity in different parts of the body: upon the ribs, and more especially about the breast, it is abundant and loose in its texture; but upon the belly, and about the head, it is dense, and so short, that we can scarcely pinch up the skin, or insert a rowel, though we effect either with the utmost facility in the chest, or under the jaw. Although the quantity of this substance depends in some measure, as we shall hereafter find, on the condition of the animal, it is always plentiful in parts possessed of much motion: hence, we find it long and loose in the scrotum, (where it invests the testicles,) upon the inside of the elbow and thigh, and under the jaw; and in the human body, we always find it thickest—most condensed, in parts exposed to pressure, more especially in the palms and soles.

The reticular membrane is made up of fibres, interwoven and disposed in such a manner as to form innumerable cells, or small cavities: and this it was, that first gave rise to the name of *cellular* membrane. These cells have a free communication with each other; a fact demonstrated by occurrences of the most common and familiar kind: who has ever seen the carcass of a calf inflated by the butcher, in order to give the veal a fatter and whiter aspect, will need no farther proof. There are many phenomena, however, connected with disease, which verify the same thing: in emphysema, (a swelling of the skin from the admission of air through a wound communicating with the cells of this membrane,) the air very commonly diffuses itself over the whole body; and a wound in the chest, or one at the point of the elbow, is most likely to be attended with this appearance. Again, in anasarca, (an effusion of water into this substance,) or in ecchymosis, (an extravastion of blood into it,) the fluids

invariably, after a time, occupy the most depending parts: hence the tumefaction of the legs, breast, and belly, in the first of these diseases, more than that of any other parts.

Into the cells of this membrane, during life, is poured forth a serous fluid, in the form of vapor, by the exhalent extremities of the arteries; (which we formerly described as terminating upon the surfaces of these minute cavities;) from the evaporation of which, that peculiar odor, so constantly perceived in flaying an animal recently dead, is emitted.

The reticular membrane does not put on the same appearances in all places:—it is, in most structures, opaque, but there is one part where texture is so extremely fine and delicate, that it is perfectly transparent: we mean the eye, in which there is a cellular bag, called the *tunica vitrea*, through which the rays of light pass without the least interception. These cells possess a certain degree of elasticity: if, for instance, we include a portion of skin between our finger and thumb, it will suddenly recoil on being liberated, and recover its original situation; a circumstance principally attributable to the elastic property of the subjacent cellular membrane.

This membrane is not very vascular: the blood-vessels found ramifying within it, are chiefly distributed to other and neighbouring parts; so that, when violent inflammation is excited in it, sloughs of it not uncommonly take place; and this happens when we introduce any caustic under the skin; the core which comes out, being chiefly dead cellular membrane. Absorbents appear to exist in great numbers in it; for if we but extravasate quicksilver under the skin, in some parts of the body, it will find its way into many of these vessels. Although this part is not

very sensible in a state of health, it becomes so in disease: the simple introduction of a probe into the cavity of an abscess, is a sufficient proof of it; there can be no doubt, therefore, but it possesses nerves.

The adipose, or fatty membrane differs from the reticular in two material points of structure: first, in its cells being perfectly circumscribed cavities, *i. e.* such as have no communication whatever with each other; and secondly, in containing, instead of vapor, fat; which, at the temperature of the living body, is oil. Knowing this then, you will at once discover why the adipose membrane should have entire cells: had they resembled those of the reticular, what must have been the consequence? The oil, or fat, like the water in anasarca, would have gravitated to the most depending parts, and have accumulated in such prodigious bunches about the legs, that progression must have become irksome, with great difficulty performed, or altogether impeded: on the contrary, as the fat is at present disposed, the animal carries it about with the utmost comparative ease. We have said, that adeps is met with in the form of oil in the living body; and in the human subject, and those animals that feed on flesh, called *carnivorous*, it retains much of its oily nature after death; but in horses, and other *graminivorous* animals, it concretes, and exhibits that appearance we are all so well acquainted with by the vulgar name of *fat*.

From exposure to the air fat becomes firm and hard: though if we break it into pieces, it still shews that it is every where intersected by pieces of skin or bladder, which, in fact, are nothing more than the membranous cells containing it. About the kidneys, the adeps, which in fat animals is deposited there in considerable quantities, assumes a whiter and harder aspect than in other parts,

for which reason it is commonly called *suet*. In many parts of the body, there is little or no fat; and when we reflect on their nature and functions, we are persuaded that its presence must have proved extremely inconvenient to them: the eyelids, for instance, had they been loaded with fat, could not have moved as they now do; nor could the penis, so constucted, have answered the purposes for which it was designed. Young animals have more fat than old, and have it deposited more upon the superficial parts of their body; in fact, the young of almost all the different species of the higher animals are enveloped in fat; well instanced, in the infant, the puppy, and the kitten. But it is not so with the foal, the calf, and some few others, which immediately after birth have the power of following their dams, in search after food: fat to them would have proved burdensome, without answering the same useful purposes, for which nature seems to have given it to the young of most other animals. We frequently see very fat young horses—indeed most of the three and four years old horses, purchased of dealers, or of the breeders, have considerable depositions of fat between the skin and abdominal muscles; or, to express ourselves in the jockey's phrase, are "fat upon the rib." The prodigious bulk that beasts, fed for the purpose, will attain, is almost incredible: a prize ox has weighed two hundred stone*; and a prize sheep, forty stone*. In the human subject also, we have had astonishing instances of corpulence: Lambert weighed fifty-two stone†. In respect of the latter, it has been remarked, that fat people do not in general live to a great age. As the cells of the reticular membrane are filled with a serous exhalation

* A stone is 8 lb. † Horseman's weight, 14 lb. to the stone.

from the terminations of the arteries, so we believe those of the adipose to be with fat: we have no anatomical proof of the existence of any distinct gland for the purpose, but we suppose it to be a secretion from the arterial ramifications distributed over their interior. In almost all animals that are healthy, copious food of a nutritive kind, and privation of exercise, will increase the deposition of fat; but in the human subject, and, indeed, in many quadrupeds the spirits appear to have very considerable influence over this secretion. We see numberless examples of people, who appear to enjoy the best bodily health, and yet are constantly meagre, though their food and habits of life tend to an opposite state; and we may occasionally observe horses and dogs, particularly circumstanced, in which, from their natural leanness, or *poorness upon the rib,* something of a mental nature would appear to operate; indeed, it is a well known truth, that if you separate a horse of an irritable disposition from others, with which he is accustomed to be stalled, he will fall away in condition, in consequence of, what is vulgarly called, *fretting from being alone;* and so much does this act of segregation affect some, that we have known them even refuse their food. Those horses are commonly the fattest that are fed on easily digested food—as bruised corn and chopped hay, and that have little or no exercise: a fact well appreciated by the horse-dealer, whose horses are *fine,* and *fit for sale,* but incapable of fatigue.

Constitutional diseases, generally speaking, extenuate the body, and more particularly those of the acute or painful kind; hence, the irritation caused by a simple puncture in the foot, will, if it be of long duration, induce a state of emaciation: under such circumstances, the absorbents are supposed to act with more than ordinary

effect, and to take up the adeps from the interior of its cells.

It has been supposed, that fat is placed near the surface of the body, in order to defend the more internal parts of it from cold: this opinion, however, is not a very tenable one, when we consider the many facts connected with the subject. It has been thought to, and probably does in some measure, facilitate the motion of various parts. That it gives great beauty, not only to the human form, but to that of horses, and other quadrupeds, no one will deny: it fills up many inequalities of surface the bones and muscles would otherwise present; the unsightliness of which we witness but too many instances of in half-starved cattle. But the principal use of fat seems to be, that of serving as a store, from which the animal can derive nourishment, when debarred of it from other sources; as if Nature, all provident, whenever She has more chyle than is required for the immediate supply of the animal economy, lays it up, as bees do honey, to nourish the system, in part or wholly deprived of aliment by accident or disease: in no other way can we explain, why it should diminish in quantity when the animal takes little or no sustenance, or account for the extreme emaciation apparent before death caused by starvation.

We have slready stated, that cellular membrane not only varies in quantity in different parts of the body, but that it exists every where in more or less abundance, according to the condition of the animal; a fact we may, at any time, obtain full demonstration of by dissection; though we need scarcely trouble ourselves so far, for the inspection of fat and lean stock, will of itself afford us ample conviction. The addition of cellular substance is al-

ways attended with a proportionate deposit of fat, which is not merely confined to subcutaneous situations, but pervades the texture of parts, and more especially of the muscles: a horse, under such circumstances, is said to be *gross,* to have flesh *loose* and *flabby,* and to be *soft,* and *unfit for work.* Young horses recently brought up to London for sale, or others just taken from grass, or that have been fed on *soft meat* in the stable, and little exercised, are all fat and *fine to the eye,* but not *in condition for work.* The common and simple management that such horses require, to put them into condition for regular work, is to give them nothing but dried provender of the best kind; to exercise them gently at first, and exert them more by degrees; and occasionally administer moderate doses of aloes, by way of emptying the bowels, and exciting the powers of absorption, in order to get rid of some of their superabundant fat. By these means, we disencumber the muscles of their useless cellular and adipose matter, reduce the weight of the carcass, and improve the wind: in fact, we put the animal in a fit condition to go to hard work, or, in common language, *season him.* In order to prove that such changes will take place in the composition of his body, let us only recall to mind, for a moment, the difference between the flesh of the stall-fed ox, preparing for the butcher, and that of the beast daily yoked to endure hard labor: reverse the states of these animals, however, and you will soon render the one fit for the knife, whose flesh before was hard and black; while the other will every day lose his elasticity and plumpness of feel, until his muscles become firm and hard, and altogether without fat. But the horse, in comparison with other beasts, may be said to possess but little adipose matter—he is an animal not equally disposed to be-

come incapacitated from such a cause; for, though we every now and then see horses enormously fat, we never hear of one whose legs are overpowered by the weight of his body, or that cannot support himself under ordinary exertion; instances of which are always to be met with among pigs, oxen, and sheep. Not only do horses possess less cellular substance in their composition than these animals, but some species appear to have it naturally either in much less quantity, or of a more dense and compact texture than others: the thorough-bred horse, for instance, exhibits, in this respect, a very different structure from the cart-horse; in him the skin, the muscles, and even the bones themselves, are less in volume, much closer in texture, and appear altogether to be composed of finer and more compact materials. We may discover a similar, though less obvious difference in the contexture of the greyhound and the bull-dog: and we may even find very evident traces of the same thing, in the component parts of a delicate female, when compared with those of a robust and vigorous athlete.

Diseases of the Cellular Membrane.

In this place, abscess is commonly considered. An abscess may be said to be, a collection of pus within a cavity formed by the cellular membrane.

In the formation of abscess, the adhesive inflammation almost always precedes the suppurative; so that adhesive matter, and probably a little serum, are first deposited, producing a consolidation of the cellular substance; and this afterwards becomes the *nidus* for pus, by gluing the membrane tightly to the skin on one side, and to the muscles on the other: hence arise the swelling and induration in *strangles*, prior to the effusion of matter.

In this stage, the swollen part feels hard, hotter than usual, and the animal flinches from pressure; which symptoms denote the continuance of inflammation, and its progressive course into the suppurative stage, unless it be put a stop to by the timely administration of our resolvent remedies. The suppurative process having commenced, at first only a little purulent matter is deposited in the centre of the tumor, by the mouths of those vessels which before effused lymph: this, by its pressure, excites absorption of the inner contiguous layer of adhesive matter, a process that now keeps pace with the secretion of pus internally; until, at length, the swelling, before diffused and hard, is converted into one perfectly circumscribed, soft, and fluctuating. At this time, in the human subject, if the abscess be of large size, there is usually a fit of shivering, followed by some degree of fever; and in young horses, we may often discover something of the same kind, during the progress of strangles, when the collection of pus is considerable. There being now no interposition of substance between the contained matter and the skin, ulceration of it ensues; so that the integument covering an abscess becomes extremely thin, and always more so at its most prominent part; where, in common language, it is said to point: at this time, surgical interference generally evacuates the abscess, though, if it be left alone, it will discharge itself by a small opening at the spot where it points, and, in this way, it is said to *burst*. With regard to the progress of abscesses in general, they mostly make their way to the surface, so as to evacuate themselves by the skin: there are however instances, in which the different outlets of the body, as the alimentary canal, and trachea, become the medium of its ejection. But should pus be effused underneath parts, which, from their

vital powers being comparatively weak, do not readily ulcerate, it will diffuse itself over a larger surface, instead of taking a direct course to the skin: hence it is, that purulent matter collected under tendinous structures, dissects its way among the muscles, and makes inroads and sinuses in various directions, unless free vent be given to it by incision. In like manner, if pus form under horn, a part wholly inorganic,—as in quittor, ulceration will give it issue by some circuitous route; for (and the reasons are obvious) no absorption of the horn can take place: this at once explains, why we are so solicitous about discharging matter collected underneath the horny sole—lest it might occasion ulceration of the sensible laminæ, and present itself at the coronet, under the form of quittor.

It is generally a good maxim, to make an opening into an abscess as soon as the maturation of it is complete: let it be understood, however, that no harm will result from a contrary mode of treatment; for it is now universally believed, that no ill consequences are to be apprehended from the absorption of pus. How often do we see strangles suppressed without any apparent ill effect! —indeed, it is the best practice, if proper evacuants be at the same time administered: we say this in opposition to a budget of prejudice, founded on ignorance, and a stubborn adherence to erroneous tenets. But in some cases, and more especially in abscess of the foot, we should discharge the pus, however small in quantity, as soon as its presence is ascertained: otherwise, as we have already shewn, much mischief is likely to ensue.

There are three modes of opening an abscess at present adopted in veterinary practice: *viz.* by incision, by the actual cautery, and by seton. Each of these operations

has its advantages, and may be preferred according to the nature of the case, as we shall find when we come to treat of particular abscesses. Fomentations and poultices are occasionally of service in promoting the processes of suppuration and granulation; but in the generality of cases, from the inconvenience with which their use is almost always attended in the horse, not to say the frequent impracticability of employing the latter, we do not have recourse to them: stimulants, more especially blisters, will best promote the suppurative state, and as for the process of granulation, that needs little or no assistance from art; except where there is any destruction of ligamentous, cartilaginous, or bony parts. The most troublesome cases of this kind are those termed poll-evil, and fistula: it is so seldom, however, that any thing like skill dictates the practice of the farrier, that we are not surprised at the tediousness and frequent incurableness of these diseases.

LECTURE X.

On the Brain and Nervous System.

THE brain, with the situation and general appearance of which we are all more or less familiar, is that soft white mass which fills the cavity of the skull. In no animal is the cranium so large, in relation to the face, as in man; in none therefore is the brain, whose magnitude is always correspondent with that of the skull, of proportionate bulk. In horses, this organ is but small when compared to the size of the body; though there are some differences (quite unimportant in an anatomical point of view) in the dimensions, as well as form, of the heads of horses of different breeds*.

The brain is divided into three portions, all of which

* "The brain of the shark does not weigh 3 ounces although the animal itself is generally 300 lbs. weight. The brain of the sheep, with respect to the whole weight of the body, bears the proportion of 1 to 150. In a dog the proportion is less: it is as 1 to 100. As we ascend in the general scale of rational beings, the magnitude of the brain bears an increased and strongly marked proportion to the size of the system in general. In the African, it is as 1 to 54. In an European, as 1 to the 50th part of the system altogether." SAUMAREZ's *System of Physiology*.

are continuous in substance: the *cerebrum,* so large that it occupies at least 3-fourths of the interior of the skull; the *cerebellum,* or little brain; and the *medulla oblongata.* That portion of medullary substance which extends from the brain through the whole length of the spinal canal, is called the *medulla spinalis,* or spinal marrow.

No viscus in the body is so well defended from external injury as the brain: on every side it is enclosed by bony walls, well constructed to make great resistance, and more especially so at those parts where external violence is likely to be received. The interior of the skull is variously furrowed and indented by the more projecting parts of the organ, to which, in every particular, its figure is nicely adapted; for it is by the shape of the brain that that of the cranium is moulded, inasmuch as the formation of the one precedes that of the other. The relative situation of the divisions of the brain, differs in the horse from that of the corresponding parts of the brain of the human subject; though both organs, in regard to the bones of the cranium, are similarly lodged: *e.g.* the cerebrum, which forms the upper and anterior portion in the human subject, constitutes the lower and anterior in the horse; while the cerebellum, which in the former is placed below and behind the cerebrum, in the horse is placed above and behind it. This difference, however, is but imaginary, being entirely referable to the position of the head; for if we place the horse's head upon a table, so that it rest upon the branches of the lower jaw, we shall find no difference whatever in the relative situation of these parts.

The brain has three coverings, called its *membranes,* or *meninges;* the *dura mater,* the *pia mater,* and the *tunica arachnoides.* Of these, the exterior is the dura mater; which, though called a membrane, is of a dense, tough,

and inelastic texture, being chiefly made up of tendinous fibres. It is so firmly adherent, by means of numerous little processes, to the sutures of the cranium, that it is with difficulty we separate them, after having sawn through the bone; and this union is further strengthened by blood-vessels, which pass between it and the internal table of the skull; for, in truth, this membrane is supplying the place of an internal periosteum. There are several broad expansions, similar in texture to the dura mater itself, stretched across the cavity of the skull; the chief use of which seems to be, to prevent one portion of the brain from resting upon, or compressing another: there are also some canals, or sinuses, within the folds of this membrane, which, like so many reservoirs, receive the blood as it flows from the veins coming from the interior of the brain. Upon its inner surface it is smooth, being lubricated by a fluid furnished by its blood-vessels: it has no other connection with the subjacent membranes, although it lies closely applied to them, than it has with the brain itself; and that is, through the medium of the many small veins terminating within its folds. The blood-vessels of this membrane, though not numerous, are of sufficient magnitude to admit easily of injection: it is a good illustration of the truth of the remark, "that the capillaries are not abundant in fibrous texture." By some the presence of nerves is altogether denied to it; though there are writers who are inclined to believe, that they have seen something like nervous filaments in its texture: in a sound state, we are pretty certain that it possesses no sensibility; for it may be cut, or irritated in various ways, without giving the animal any apparent uneasiness.

The *pia mater* is that membrane which closely envelopes the substance of the brain, dips down between its

convolutions, and adheres to its surface by numberless minute blood-vessels, easily lacerated by stripping it off with the forceps. It differs altogether in its texture and appearance from the dura mater; presenting a smooth surface exteriorly, but a rough and villous one next to the brain, and being composed of a beautiful network of blood-vessels, united together by a delicate cellular tissue: it is, in fact, the immediate source from which the brain derives its blood, and, at the same time, the medium through which the unexpended blood is returned to the sinuses of the dura mater.

The third membrane has, from its extremely thin and delicate texture, been compared to the spider's web, in allusion to which the name of membrana *arachnoides* has been given to it. It is placed between the two others, closely adheres to the pia mater, and separately invests the cerebral eminences and depressions, without, like that membrane, insinuating itself between the convolutions; from which circumstance, it is, with pains, demonstrable in some places about the base of the brain. Though there can be no doubt but it possesses organization, hitherto the most successful injections have not shewn any blood-vessels in its substance. Of its use, we dare not speak: physiologists are unable to say for what purpose so delicate and transparent a structure is here interposed.

From the vascular connection which subsists between the scalp, upon the exterior of the skull, and the dura mater, upon its interior, we have at once an explanation of that apparent anomaly in pathology, *viz.* that external injuries of the skull frequently induce symptoms of inflammation of the brain, or its membranes: in the human subject, such wounds are always considered, on this account, as dangerous, and, indeed, it not very unfrequent-

ly happens that they prove mortal. Though we have never seen a case of this description in the horse, there does not appear to be any good reason why we should not be cautious how we make or treat wounds of such a nature.

A fluid, differing from serum in its properties, though like it in appearance, is occasionally effused between the dura mater and tunica arachnoides, or, more commonly, underneath the latter membrane, (as well as within the substance of the brain itself,) constituting a disease, termed *hydrocephalus:* it rarely happens in horses, but in the human subject, and more especially in children, it is by no means an unfrequent cause of dissolution.

On the Brain.

We have already given an outline of the situation and division of this organ ;—we shall now make some general observations in regard to its structure. If a vertical section is made of any part of the brain, we perceive that its interior presents two substances of different colors: the outer of these, of a dirty greyish hue, is called the *cineritious,* or *cortical* part; the inner, which is white, and of which the chief bulk of the organ is composed, the *medullary.* The cortical part is not always the outer; in some places, the relative disposition of the medullary and it, is reversed ; it is that, however, in which the blood-vessels of the organ are most conspicuous; for, in consequence of being closely invested by the vascular pia mater, it receives the numerous ramifications of arteries transmitted by that membrane for the nourishment of the interior parts of the brain. On the other hand, in the medullary portion, the blood-vessels, which in health only convey the colorless parts of the blood, are so minute that they es-

cape notice; unless, occasionally, here and there, when it has been inflamed, the bloody specks upon its divided surface, denote the division of those that have become of sufficient magnitude to admit the red globules.

By the investigations of the best anatomists, the brains of animals appear to be of a fibrous nature; and in many parts of the human brain (which is larger than that of any other animal) the disposition and course of its fibres have been traced: such inquiries, however, have, unfortunately, not led to any elucidation of the sensorial functions, nor are we aware that they have been attended with any advantageous result in regard to its pathology. After all, the truth is, that the intimate structure of this organ is still unknown to us. With regard to the cineritious, or cortical part, there is much reason to believe, that it is almost wholly constituted of the ramifications of blood-vessels of extreme exility; from which, others, still more minute, are distributed to the substance of the medulla.

It is here worthy of remark, that in no instance does Nature so invariably present us with the same structure and arrangement of parts as in this viscus: in almost every other in the body, we can discover some little variation, in this respect, in different subjects; but in the brain, the same uniform appearances ever present themselves on dissection: so intimately united do structure and function seem to be in this organ. The cerebrum is divided into two halves, called *hemispheres,* each of which is formed of parts precisely similar, in every particular, to each other; so that, in fact, every part of the organ may be said to be double, *i. e.* its two halves are constituted of several small portions, which are not only perfectly alike in structure, but are of corresponding

symmetrical forms and dimensions: a remark that not only applies to the brain itself, but one that holds good with regard to the spinal marrow. An animal, therefore, has, to all intents and purposes, two brains; and, probably, for the same reason that he has two eyes, two ears, and a double tongue.

The arteries which supply the brain, are the two vertebrals, besides two other considerable branches from the carotids, called the internal carotids: its blood is returned from the sinuses of the dura mater by the vertebral and jugular veins. It is on the supply from the vertebral arteries, however, that this organ mainly depends, for the preservation of that energy essential to the support of life; for if ligatures be put on these vessels, the animal speedily dies; whereas both the carotids may be tied without occasioning any apparent ill effects.

On the Nerves.

The nerves are soft, white, fibrous cords, proceeding from the brain and spinal marrow to all parts of the body.

From the brain issue ten pairs of nerves, called the *cerebral;* and from the spinal marrow, thirty-six, denominated the *spinal:* making, altogether, forty-six pairs of nerves in the body.

In some animals, among which may be ranked the horse, the nerves, in general, are larger than those in the human body; though the brain of the latter far exceeds in bulk the same viscus in the quadruped. "The spinal marrow," says Richerand, "and the nerves, in the different animals furnished with them, are larger in proportion to the brain, according as the animal is more distant from man in the scale of animation."

At their origin, the nerves are covered by the dura mater, and a membrane similar to, if not a continuation of, the pia mater; but the tunica arachnoides cannot be distinctly traced upon them: these coverings, however, seem to proceed only to a short distance, for if we examine the *vaginæ,* or sheaths, in which they are afterwards inclosed, we shall find them to be nothing more than condensed cellular membrane. It is to this covering that the compactness and density of a nerve are chiefly owing; when deprived of it, but a slight degree of pressure will destroy its texture: indeed, there are some nerves whose pulpy nature would subject them to perpetual contusion and laceration, were it not for the protection afforded them by this compact cellular envelope.

The substance of the nerves, like that of the brain, is fibrous. Their fibres, which are connected together by cellular membrane, take a serpentine course, as may be seen by a close examination of the numerous white lines upon their surface; so that if we unravel a nerve, we shall find it to be made up of an infinite number of *fibrillæ,* or filaments, the minutest of which still retains a serpentine form. Some have imagined that these fibrils are tubular; others, that they are cellular; but, in truth, we must confess ourselves still unacquainted with the intimate structure of the nervous system. It has been generally supposed, that nerves were inelastic in themselves, and that any extension, or contraction, they admitted of, arose from the elasticity of their component cellular membrane; Sir E. Home, however, has proved, by some ingenious experiments, that they possess a power of retraction when divided in the living body; a circumstance which, of late, cannot altogether have escaped the observation of those, who have performed the operation of *neu-*

rotomy *. This retraction does not seem entirely to depend on any inherent contractility of tissue, otherwise extension of the nerve would be a necessary preparative; on the contrary, it happens under the most complete state of relaxation; an effect that will not take place in the dead subject under similar circumstances.

A nerve is said to have two extremities:—a *cerebral,* and a *sentient:* the former is that part by which it is connected with the brain, or spinal marrow; the latter, that by which it terminates in the various structures of the body. It has been usual to say, that the nerves arise, or have their beginning, from the brain, though it would appear, from some recent investigations into their composition and functions, that we might, with equal propriety, regard them as deriving their origin from the organs to which they are said to be distributed, and as ending in the sensorium. Supposing, however, that they do issue from the brain, there still remains some difference of opinion respecting their beginning, or roots. By some it is thought, that they are not continued from the substance of this organ, but are merely attached to its surface; though there are nerves which we certainly appear to trace beyond the superfices—into the interior of it, as is the case with the optic; so that although it is customary, for the sake of anatomical detail, to assign certain parts of the brain as the beds or origins of certain nerves, we are still, in truth, ignorant of the manner in which their original or radical fibres are disposed. It would appear, from many familiar facts, the result of experiments and pathological observations, that the nerves distributed to one side of the body, arise from the opposite side of the

* Vide Lecture XI.

brain; and if this be true, there must be somewhere a decussation of them: if an injury be received on the left side of the skull, the right side the body will become paralytic; an effect that would not happen, unless there was a ready communication between one side of the brain, and the nerves of the opposite side of the body, by means, in all probability, of direct continuity of fibre. If one column of the spinal marrow be cut through, the animal will become paralytic, not on the opposite, but on the same side; a fact, which, although it at first view appears contradictory to what we have just stated, in truth tends to confirm this opinion: for the medulla spinalis is composed of two columns, the fibres of which decussate each other in the same manner as those of the nerves are supposed to do.

The nerves, generally speaking, soon after their origin, form various communications with others in the vicinity; in many parts, by such frequent intercourse, that a kind of nervous net-work is formed, to which the term *plexus* is applied: some nerves, however, pass directly from the brain to their destinations, without either receiving, or giving off any communicating ramifications—such are the optic and olfactory. In their course, the nerves generally proceed in straight lines to the parts to which they are distributed; deviating only, like the arteries, for their own safety, or for some wise and evident purpose. Sometimes they run with the blood-vessels, sometimes alone: we commonly find a nervous trunk, and in some places two, accompanying the principal arteries and veins of the extremities. The branches of the nerves, for the most part, come off at acute angles: those springing immediately from the trunk, send off others of smaller size,

until filaments of such minuteness are formed, as to be invisible to the naked eye.

The twig-like ramifications of nerves end in two different ways: either by inter-communication—which is similar to the anastomosis of arteries, or by sentient extremities within the substance of those organs to which they are distributed. In the retina, a part of the eye entirely composed of the expanded termination of the optic nerve, an extremely delicate tissue, of a pulpy consistence, and semipellucid yellowish appearance, is observable; from which, it has been conjectured, that the extremities of other nerves may be somewhat similar: but, to confess the truth, we do not know what form they actually assume—we think it very probable, that their mode of termination may vary according to the nature and texture of the part in which they are expended. The nerves are very unequally distributed to different parts: the organs of sense, the skin, muscles, and mucous membranes are plentifully supplied with them; the serous, fibrous, and medullary membranes receive but few; and none have yet been detected in either cartilage or tendon*.

A ganglion is a little knot or swelling upon a nerve, perfectly natural to it. We find them in various parts of the body; more especially about the neck, chest, and abdomen. From the fact of their being peculiar to those nerves which run to parts possessed of involuntary motion, they have been regarded as the means whereby such functions

* And yet the granulations of these parts possess sensibility, of which we have recently had a very marked instance, in the case of a broken knee. The horse never failed to snatch up the leg, every time the granulating edges of the extensor tendon were touched with the probe.

are supported; hence those nerves of the eye which are dispersed upon the iris, have them, while others going to the muscles of the organ, whose actions are under the influence of the will, are without them: the opinion, therefore, to say the least of it, is an ingenious one, though this is insufficient proof to establish it.

On the Physiology of the Brain and Nerves.

The brain, in a physiological point of view, is to be regarded as the primary organ of sense—the *sensorium;* as the seat of perception, in which cognizance is taken of all impressions made on those organs to which nerves are distributed; and as the source of volition, or the part from which the will is transmitted along the nerves to the organs of voluntary motion. If the brain of an animal is severely injured, or diseased, a state of general insensibility is induced, and the body rendered incapable of moving itself: it does not follow, however, that *all* feeling be lost, even though the brain itself be removed, for the spinal marrow alone has been found capable of preserving a degree of sensation. That a violent blow on the head, or pressure from any cause, no matter what, upon the brain itself, will deprive an animal of sensation and voluntary motion, we have frequent opportunities of witnessing in horses suffering from the effects of severe falls more especially from falls backward, upon the vertex, in the act of rearing; from which accident, it is not uncommon for them to remain for several days perfectly senseless; all attempts to rouse them proving ineffectual: you may cut or burn them, hold a lighted candle to the eye, or discharge a pistol close to the ear, and every part will remain as motionless as if the animal was dead. In op-

position to this, there are particular morbid conditions of the organ, in which its functions are preternaturally excited: inflammation is, perhaps, the most common cause of this derangement; hence it is that we account for the extreme irritability of horses in the *mad* stage of staggers, and the uncommon degree of force with which they exercise their muscular powers, during the continuance of the paroxysm.

Though sensation and voluntary motion are so exclusively cerebral functions, that they cannot be duly performed unless direct communication be kept up with the sensorium, in a perfectly sound and impressible state, it is different with regard to those motions that are involuntary. When a horse becomes stunned from a blow, or during the lethargic stage of staggers, although sensation and the power of locomotion are nearly, or quite lost, still does the heart beat, the chest expand, and the alimentary canal continue to digest food. An admirable instance to show how needful Nature has been in the preservation of life, even during the disturbance of organs more immediately its source and seat: for had these parts been subject to the same laws as govern the motions of the limbs, death must have supervened on every accident of this description: whereas, now, life is supported, while the brain is recovering from the effects of the mischief.

It is a curious fact, that, although the brain is the organ of feeling, there is one part of it, apparently of itself, devoid of sensibility; *viz.* the cortical, or cineritious portion; which has been cut, torn, taken out, and otherwise injured, in the living animal, without causing any very evident marks of pain; and this will appear the more extraordinary, when we consider that but little pressure upon its surface will instantly occasion violent and dan-

gerous effects. Also the medullary matter may be pierced to a certain extent, from the surface of the cerebrum, without much inconvenience; and even a little of it may be removed without any ill consequences: we must be exceedingly cautious, however, in making this experiment, not to penetrate too deep into its substance, or the shrieks of the agonized animal will soon inform us of the extreme sensibility of its interior parts. Instances have occurred in the human subject, in which patients have lost, or had removed, from time to time, large portions of the cerebrum, without any apparent derangement at the time, or subsequent disturbance of the intellects.

Concussion of the brain, a very frequent accident in the human subject, though comparatively a rare one in the horse, produces symptoms very like those arising from immediate compression of the organ. In violent degrees of it, the patient is rendered perfectly insensible, though, in less severe cases, only stupor and partial paralysis ensue: in either case, it is a disease never unattended with danger, and one which very frequently terminates in death.

Violent injury, or disease of one side of the brain, deprives parts of the opposite side of the body of the power of motion, and, but not always, of sensation: *paralysis*, or palsy, is the general term used to denote this affection, though it is sometimes specified by the word *hemiplegia*. This state is commonly induced by pressure upon the brain, or spinal marrow, either the effect of the depression of a piece of bone upon its surface, or by the effusion of blood, or pus, upon or within its substance; we are, therefore, in such cases, not to apply our remedies to the paralysed parts, but to seek for the cause whence the nerves of these parts take their origin. The extent of paralysis will depend on the nature of the

and even if he were, he could not move the leg, for the muscles will now no longer obey the will. Not, however, that the nerves themselves possess any power of motion, though they are to be regarded as the indispensable agents of the brain in all such movements as are regulated by volition. In like manner, though the nerves be the organs by means of which parts are endowed with sensation, they of themselves, unconnected with the brain, are wholly devoid of feeling: you may prick, or cut, for example, the extremity of a nerve, whose communication with the sensorium is cut off, without the animal's even knowing that you are touching it; but you have only to irritate the opposite end, and you give rise to instantaneous convulsions. Precisely the same thing happens if the nerves be tied, or otherwise compressed: you may cut or burn the parts to which they are going, apply light to the eye—if it be the optic nerve, or sound to the ear—if auditory, and no effect whatever, will, in either case, be produced.

The functions of volition and sensation, are, in themselves, entirely unconnected; *i.e.* they may subsist independently of each other—one will remain where there is a total absence of the other. Cases of paralysis in the human subject often occur, in which the lower extremities retain their feeling, though the patient has lost all power of moving them: the reverse of this has also been noted.

The nerves going to the organs of sense, possess a power of being acted on by peculiar *stimuli: e.g.* the nerve called the optic, which is distributed to the interior of the eye, receives the impressions of the rays of light, and transmits them to the brain, where perception of a peculiar kind is created, and the result is vision; in

like manner, the vibrations of sound affect the auditory nerve, which is spread over the internal parts of the ear; odors of all kinds are perceived by means of the olfactory nerves, belonging to the nose; while the tongue, through the medium of nerves called the gustatory, is endowed with the faculty of tasting: moreover, in the human subject, the extremities of the fingers have a power of feeling, distinct from that of common sensibility. All these organs however have, in common with every other part of the body to which nerves are given, what is called ordinary sensation; and this may remain unimpaired, though the proper sense of the part is entirely lost. If, for example, we are deprived of vision, by some disease or injury of the optic nerve, our eye is still affected by such *stimuli* as act on parts possessed only of common sensation—like them it can feel heat and cold; in like manner, though we be deaf, yet are our ears not devoid of ordinary feeling; nor is our nose deprived of its general sensation, because a common catarrh may have destroyed its power of smelling. The reverse of this however will not apply: no part that has lost common feeling, is in the least affected by its appropriate *stimulus;* nor is one set of nerves having a specific susceptibility, influenced by the peculiar excitant of another. For examples, no part of our body is endowed with that peculiar faculty of feeling which resides in the points of the fingers; or, in the horse, in the extremity of the nose: the eye is not affected by the sound of a cannon, nor the ear by the most intense light; the tongue cannot smell, nor can the nose inform us of the sense of taste.

The agent producing sensation, is not, generally speaking, in direct contact with the extremity of the nerve: when we feel any thing, the nerves of our fingers

do not touch the body felt, for the cuticle (which is itself an insensible part) is interposed; through which, consequently, we ascertain the physical properties of a substance, in a similar manner to what we do, though more imperfectly, through a thin glove. This covering appears to be necessary, to defend the sentient extremities of the nerves from the action of those external *stimuli*, which, were they allowed to come in immediate contact with them, would be productive of acutely painful sensations: hence we find the delicate expansions of the olfactory nerves upon the pituitary membrane, always besmeared with mucous, to them a sheath of defence against pungent odors, or other irritating matters.

If the trunk of a nerve be in any way irritated, the sensation produced in it, will be transmitted through its various branches to the parts to which they are distributed: if, for example, the ulnar nerve, which passes over the elbow, be compressed, or accidentally struck, we know that a peculiarly unpleasant feeling will be experienced in the little and ring fingers, in which parts its ultimate ramifications are dispersed. So curious is this phenomenon, that if the nerve be irritated even after its division, still will the effect be felt, the same as if it were conveyed along the undivided branches: hence it is, that persons after having undergone the operation of amputation, often complain of a pain in their hand, or foot, though the limb be absolutely in another room. When we speak of our feet, or hands being asleep, that well-known tingling sensation in them, is the effect of the nerves of the part recovering their sensation, which has, for a longer or shorter time, been suspended, in consequence of compression of the trunk, or branch, from which they spring.

Nerves deprived of those coverings which Nature has provided for them as a shield or defence from external agents, acquire extreme sensibility: hence the pain of a blistered surface, and the excessive irritability of an inflamed mucous membrane. The mere exposure of their trunks, in a denuded state, however, is not attended with painful sensations, or even the touch of them under such circumstances; but if they be pricked, cut, or otherwise injured, convulsions immediately ensue: nothing can illustrate this better than the operation of *neurotomy**—we detach the nerve from its surrounding connections, and clean it, with little or no apparent inconvenience to the animal, but no sooner does the bistoury wound its medulla, than his struggles remind us of the acute pain we are inflicting.

Connected with our present subject is a curious phenomenon, physiologists have characterized by the term *sympathy;* about which little else is known, than that certain effects, with many of which we are all more or less acquainted, are referred to such a source. Not only will one nerve that is, from any cause, unnaturally affected, give rise to a similar condition of its fellow of the opposite side of the body, but derangement in one set of nerves in a particular organ, will occasion more or less disturbance in those of another, with which they have not the least communication, nor apparent relation. In the optic nerves, the first of these cases is well exemplified: how often do we see—nay, we generally prognosticate, that when one eye has become the subject of opthalmia, the other will be, sooner or later, also inflamed. If a horse receive a punc-

* Vide Lecture XI.

ture in the foot, simple as the wound is, yet will it often increase the irritability of the heart so much, that the pulse will rise to twice or thrice its ordinary quickness, and the animal at length sink from sympathetic fever: and this is the more surprising, when we recollect, that large flesh wounds, or even the division of the nervous trunks themselves in the legs, are comparatively trifling accidents. Nothing is more common in the human subject, than for disease of the testicles to excite vomiting; and in susceptive females, merely beholding an unpleasant sight, or perceiving a disagreeable odor, will now and then have a similar effect. Breathing itself is a natural sympathetic action; for an animal is first compelled to respire in consequence of experiencing an uneasy sensation in the chest; (probably owing to congestion of blood there;) though it seems afterwards to be carried on through the influence of habit. Perhaps in no instance is the action of sympathy better illustrated, than by observing what happens between that part of the throat, called the *epiglottis*, and the muscles of expiration; if the former be irritated, the latter will be immediately thrown into convulsive action: in common catarrh, to this part, being inflamed, even air itself becomes an irritant; hence cough is generally an accompanying symptom, and one that is always aggravated by the respiration of *cold* air. For the same reason, horses cough when the weasand is tightly compressed between the finger and thumb, a practice common with our horse-dealers. In disease we have numerous and striking examples of the influence of sympathy; indeed, its effects are more or less observable in all constitutional affections. In the disease called staggers, the symptoms of which indicate more or less disturb-

ance of the cerebral functions, the exciting cause is very frequently overdistention of the stomach, the brain itself being only sympathetically affected: and again, what is more common than to say, "a horse is looking unhealthy in his coat," or more demonstrative of ignorance than not to know, that the cause of it is not to be sought after in the skin, but in the alimentary canal.

The nerves then support sensation and volition in the body, and its different sympathetic affections, as well as the peculiar functions of the several organs of sense: how far they are employed in the generation of animal heat, we repeat, we have still to learn. In man, who holds the first place among animated beings, the brain is not only to be considered as the seat of sensation, and the source of volition, but as the organ of the mind—the part in which all those intellectual powers, for which he is so pre-eminently distinguished, reside. Not, however, that the actions which support life are greater in him on this account; on the contrary, they are known to be weaker; for, we find, in proportion as the sensorial functions are few and limited, so, in general, are the powers of animation strong, and the restorative means great: hence it is, that a polypus, one of the simplest animals in nature, may be cut in two, and both parts will survive and grow again, and produce two distinct polypi; and hence it is, that the living powers of the fœtus are greater than those of the adult, although it can neither see, nor hear, nor smell, nor taste. Such, indeed, is the influence that the mental operations have over the corporeal in man, that there is no animal equally subject to disease, or in whom its ravages are so extensive and insupportable: we may yet go further, and say, that those persons whose

passions are easily moved, present us always with the most unfavourable aspect under disease; a remark made long ago by those engaged in the practice of medicine.

How, or in what manner, the functions of the nervous system are carried on, is a mystery which physiology has not hitherto unveiled to us: though this, like other inexplicable phenomena, has not wanted speculative opinions, some of which probably have tended to elucidate, though they have one and all failed to unravel the secret.

Some have contended, that the nerves were so many vibratory cords, and that impressions were conveyed along them by an oscillatory motion, or vibration of them; others have thought that they were hollow, and transmitted a certain fluid, with astonishing rapidity, through their canals; while physiologists of more recent date, seem inclined to resemble the nervous functions to the phenomena of electricity, more especially to that species of it now known by the name of galvanism.

From a multitude of experiments, the reproduction of nerve has been so fully demonstrated, that no one at the present day is sceptical of the fact. Whether, or not, its precise original tissue be renewed, it is not worth our while to enquire; suffice be it to observe, that the nerve is re-instated in its functions, which, to all appearances, are carried on with as much celerity and regularity as ever. An old experiment, but one that sets this question at rest, is, that if the nerve which forms one of the par vagum, or eight pair, be cut through in the horse on one side only, no inconvenience is perceived to result; but if the pair be divided, the animal becomes immediately convulsed, and expires. If, however, there be an interval of two, or three months between the division of these

nerves, the animal not only survives, but appears to experience from the last operation, as little annoyance as he did from the first: a circumstance that cannot fail to convince us of the fitness of the regenerated portion of nerve, of the opposite side, as a substitute for the original formation. Veterinary practice, however, has of late adduced so many instances of the reproduction of injured nerves, that no member of the profession can harbour a doubt on this point: were it not, indeed, for this power of Nature to restore parts to their pristine condition, we should not have to recur to the operation of *neurotomy*, in those cases where a portion of nerve has been once excised.

If a nerve be simply divided, union of it ensues, and consequently sensation returns, in about two months; but if a portion of it (say an inch) be excised, and the divided ends allowed to retract, union and restored sensation cannot be timed: we have known them to be present at the expiration of two years; and we have heard of some few cases in which no signs of their return have ever been noticed. In these cases, after a short interval, the retracted ends are formed into little, hard, round knobs, having a cartilaginous feel, and possessed of extreme sensibility. They vary in size, from that of a pea to a hazel nut; so that it is not uncommon, when *neurotomy* has been performed at the fetlock, to perceive them formed into little prominences under the skin; which, in some horses, are the seat of sudden, *dropping* lameness, in consequence of being struck, in going, by the opposite fore foot*.

* Though the question of the regeneration and consequent restitution of function of a nerve simply divided, no longer remains undecided in our mind, we submit the following extract from Mr.

LECTURE XI.

On Neurotomy.

NEUROTOMY—for so we take the liberty to name an operation, hitherto called, (and we cannot help thinking

SWAN's valuable practical work on this subject*—one grounded on experimental inquiry, in further confirmation of this, to us at the present day, an important point. "It will be seen from these experiments, in the first place, that after a division of a nerve, the extremities of the divided portions (retract,) become enlarged and more vascular, but especially the upper portion; and coagulable lymph, having the appearance of white of egg, is effused, which soon becomes vascular. In a few days the coagulable lymph from each portion becomes united, and anastomosis forms between the blood-vessels; the coagulable lymph gradually assumes a firmer texture, and the number of the blood-vessels diminishes, and the newly formed substance appears to contract, like all other cicatrices, so as to bring the extremities of the divided portions nearer and nearer to each other. It is difficult to determine from an experiment on the limb of an animal the exact time at which the nerve performs its functions. In eight weeks after the division of the sciatic nerve, I have observed a rabbit to be in some degree improved in the use of its leg, but at

* *A Dissertation on the Treatment of Morbid Local Affections of Nerves:* to which the Jacksonian Prize was adjudged by the Royal College of Surgeons.

with equal impropriety,) sometimes *nerving*, sometimes *unnerving*, consists in the division and excision of a portion of nerve, with a view of allaying pain, and relieving lameness.

If the withdrawal of pain not to be assuaged by other means;—if the restoration of an incurably lame horse to a state of comparative soundness;—if one, or both, we say, be considerations of importance, the first on the score of humanity, the last on that of interest:—then neurotomy will take the lead of modern discoveries in veterinary science. As an emanation from that institution to which the veterinary art, as an useful branch of natural knowledge, owes its rise and progress in this country, it is our duty to regard this operation in a favorable light: when we find, however, that the professed objects of it are no less than those we have here represented, with how much more exultation should we, as veterinarians, hail the disclosure of such a valuable addition to our present practice. Such, we cannot entertain a doubt, are the opinions of its zealous promoter; such we believe those of its numerous advocates to have been; and such would they have continued to be, had they faithfully followed the in-

the end of eighteen weeks it was not perfect. When the nerves of the leg of a horse have been divided just above the foot, they are sufficiently restored to perform their functions in a very great degree in six or eight weeks; but it must be observed *that these nerves are only formed for sensation*, and it is very different with the nerves of voluntary motion"—"the re-union is sometimes accomplished by granulations." "Secondly, I would observe, that punctures and partial divisions of nerves heal in the same way as when there has been a total division; and that, even on the first infliction of the wounds, the functions of the nerve are very little impaired."

structions of him, who first taught them this improvement in their art.

Who this was, we need scarcely mention at so advanced a period from the first promulgation of the discovery; indeed did we not imagine that we should be accused of a dereliction of what is due to that gentleman from the profession at large, and of esteem on our own part, we should think it unnecessary to state, that to Mr. Sewell, assistant professor to the veterinary college, belong the merit, and the reward, resulting from its almost universal adoption. The most flattering testimony our discoverer could possibly have received, are the futile attempts that have been made to usurp the authorship of his production; the most solacing, the unequivocal marks of approbation conferred on it by a committee of the governors of that institution, which is not a little benefitted by the very extensive practical application of it.

We shall, in the first instance, take a view of the operation itself—looking into its merits and demerits—explaining how it relieves, and in what manner it should be performed, and then consider its applicability in practice. Knowing that the nerves, as agents of the brain, convey sensation to and from every part of the body, and that one of the best and most obvious proofs that such is their use, is simply the division of them, at first, it might seem perfectly natural, that we should resort to such an operation to remove pain, which, in fact, is nothing more than preternaturally acute sensation: we must recollect however that the nerves have other functions to perform, and some, perhaps, with which we are not hitherto acquainted, and that the division of them is not effected without lesion to other parts—considerations, possibly, that have hitherto much restricted surgeons from similar attempts on

the human subject. It was not to be expected, however, that some experiments of this kind would not be made on horses; and, accordingly, we find that long ago, at the veterinary college, some, consisting in simple division, were instituted; but the result proved fruitless: and we ourselves divided the nerves of the arm for lameness in the foot, in the year 1812, without being aware that the experiment had been previously made. All this does not detract one single iota from the praise due to Mr. SEWELL; on the contrary, it contributes to enhance the value of his production, and to shield it from the scurrilous attacks of dabblers in the art: for however correctly some may insist, "that it is not a *discovery*," we contend, that it embraces all the advantages of any one of modern date, and reflects so much the more credit on its author, inasmuch as it has been raked from among many rejected and valueless gewgaws of the present day. It may now be asked, why we did not succeed? Purely because our knowledge of the distribution of nerves was *defective*, and therefore practically of *no* use to us: we thought we had divided all the nervous trunks of the arm, and consequently had paralyzed the leg and foot; but, in truth, we had not done so much to produce that effect, as if one of the pastern nerves only had been severed; for there were others left uncut, to carry on sensation, and thwart the sole object we had in view: such errors does an *imperfect* anatomy lead us into. For aught we know, the nerves may have been divided many yars ago, but if this be an argument against the operation, why should we still adhere to the same principles in our practice of shoeing, when so many said-to-be *new* and *valuable* systems are offered to our notice at this day? Many of the improvements in shoeing have been received with as much fer-

vor for their promotion as ever neurotomy was, but few have borne even the test of argument, and much fewer that of experiment: neurotomy, on the other hand, after the severe ordeal it has passed through, is still practised by those who have not expected from it more than was held out in the first instance, but have steadily persevered in it as an useful addition to their catalogue of remedies. Mr. SEWELL never hoped *eodem collyrio mederi omnibus*, but contented himself with adopting it as a last—an only resource; so that *au pis aller* he can incur but little censure for having practised it; and he may, and not seldom, have the gratification to see the prematurely worked-up hunter rescued from the slaughter-house, and restored to the service of his compassionate master.

Our object in performing this operation, is to destroy sensation; and in doing this in the foot, we have not found, that the growth and uses of that organ, so far as its preservation in health goes, sustain impairment: we believe that every part remains *in statu quo*, so long as the whole be preserved from the effects of external violence; and, under certain circumstances, we think that the organ itself is even benefitted by the change. We know also for certain, that the formation of horn continues undiminished*. Notwithstanding these facts, however, there is an argument against neurotomy, which we cannot altogether refute, though we shall endeavour to deprive it of some of its main supports; and that is, that if the nerves of the foot are, comparatively speaking, of so little use, as from this statement they would appear to be, why is it so plentifully furnished with them,

* It has been remarked to us, that more horn is in some cases produced after this operation.

it not being in the horse the organ of feeling? This operation has certainly taught us one, if not two important uses of nerves to the foot, which did not occur to us before: *viz.* that they (the nerves) are the safeguards of that organ in health, and, if we may be allowed the expression, its nurses in disease; they inform the animal when the foot is impaired, and warn him that it will be still farther injured by being made use of:—pain is the consequence of injury, the limb is favored, and the disease in it arrested simply from repose; so that it now and then subsides without medical aid. But in the insensible foot, the reverse of this is the case: the disease is aggravated by the animal's using the part as he would were it perfectly healthy; (he being totally unconscious of its presence;) and a destruction of the organization of the foot, if not the loss of life itself, may happen in consequence of a comparatively trifling accident. Withal, however, this is not so formidable an objection as one would at first imagine; for, regarding the horse as an animal immediately under the superintendance and management of man, the keeper of him in health, and his attendant in disease, it is not to be expected, that any malady would remain long in a part so often examined as the foot, without being detected; which, in fact, is tantamount to our being informed of it by the animal himself.

Do such horses go with that natural ease and freedom that others possess?—in other words, is there any difference in the action of a horse that has been so treated?

We have always thought, and we still believe, that the animal loses a something, probably a kind of feeling which affects his tread sufficient to inform his rider, that his feet are not what they originally were; for there cannot be a doubt, (and this is one of the happiest instances

in confirmation of it,) that the horse feels the ground upon which he treads; and so far, we contend, the foot is the organ of feeling. We do not pretend however to restore organization; we do good by still more impairing that which remains: like the mechanic who cannot imitate the exquisite workmanship of his master, we are content to save the machine, imperfect as it is, from total destruction, by the removal of that which appears to be incompatible with its present operation. Having thus canvassed two objections, which, to us, appear to have more weight than any, or even all others, that can be urged against the operation; we shall, or we shall overstep our limits, dismiss this part of our subject, by saying—that, whatever they be, they do but in a small degree deserve notice, when contrasted with the benefit resulting to a horse crippled and useless, and of no value to his possessor.

The place of operating has now become a subject of dispute: some prefer the fetlock, the part first determined on; others, above it; others again, operate above the joint on one side, and upon, or below it on the other. Mr. Sewell, and all who follow his directions, choose now the sides of the large pastern bone—*below the fetlock*, for the operation*. We have performed it in all these different situations; but as our cases have been very inferior in number and variety to those of the assistant professor, we rather submit to his opinion than venture one of our own. Mr. Sewell's object in excising the large pastern nerve, is to preserve sensation around

* Should the fetlock be the seat of lameness, (which, by the bye, it rarely is so as to require the operation,) we must divide the metacarpal nerves; taking care to cut off the communication of the anastomosing branch.

the front of the foot—a part, in general, free from disease: and this is now fulfilled, since the nerve that goes thither, is a branch from the metacarpal.

The operation is by no means difficult to him acquainted with the anatomy of the part. The horse being cast, and properly secured, and the affected limb extended and placed in a convenient position for the operator, an incision, about 1½ inches long, is to be made upon the side of the large pastern bone, opposite to, and in the direction of, the large pastern nerve; then, having cut through the cellular substance, so as to lay bare the trunk of this nerve, (anteriorly to which, and in contact with it, lies the artery, which must be carefully avoided,) raise it with a tenaculum, and divide it by the introduction of a probe-pointed bistoury, as high up as the external wound will admit: lastly, clean it from surrounding adhesions, and detach it from the continuation of the trunk below, so as to excise a portion about 3-fourths of an inch in length. The operation requires to be performed on each side, there being two separate trunks below the fetlock; and, of course, on both legs, should both be affected. To close the wound, we rather employ adhesive plaster than suture, with straps of which the pastern may be encircled, if the hair be closely shorn off: where suture is preferred, the interrupted is the best, and about three or four stitches are sufficient. The legs should be bandaged* after the operation, and the horse not allowed to lie down during

* We commonly dip the bandages, previously to applying them, in the saturn wash. It is also a good practice, to give a dose of physic, and keep the horse, during his confinement, on bran, instead of corn. We may observe, that, in many cases, the bandages only are sufficient.

the first night, or be moved for the three or four following days, lest the parts be disturbed, and union by adhesion defeated.

Though the operation admit of very extensive and diversified application, its subjects have been from the first represented to be, what all subsequent experience has shewn they ought to be, *horses incurably lame;* by which we mean, *cases that will not admit of relief by any other means.* Had those who so enthusiastically listened to Mr. Sewell in the first instance, but attended to this short and simple precept—one that, not a little to his present satisfaction, he has forcibly inculcated all along, they would not have lost the confidence of their employers, nor have reaped so short a harvest, nor have brought the operation itself, within their sphere of practice, into early disrepute. Surely, if any thing can convince us of the truth of what we have just advanced, it is the undeniable fact, that, while many others have exploded neurotomy from their practice, in consequence of the numerous failures they have experienced, Mr. Sewell now performs it with redoubled confidence, seeing that he seldom meets with an unsuccessful case. And this has arisen, in the greatest measure, we repeat, from a malselection of subjects; though there are, doubtlessly, faults in operating on, as well as in the management of these horses, to which we may ascribe the unfortunate issue of many untold-of cases. To our esteemed friend, Mr. Sewell, with whom we have had some very interesting communications on this subject, we are indebted for many truly valuable and incontrovertible facts relative to neurotomy; some of which we shall now submit to the consideration of those, hitherto led astray by false

representations, or who may have been deterred from operating for want of more authentic and more extensie information.

Mr. SEWELL has operated on upwards of five hundred horses; and the general result of the practice shows, that in about eight cases out of ten, full and complete success has manifested itself, so long as the horses have remained under his care; for want of proper subsequent treatment, however, and attention to his directions, some few out of this number have turned out unfortunately. Lest, then, our adversaries accuse us of cloaking, or wishing to compromise that which, to them, may appear a very serious and even insurmountable objection, we will tell them, once for all, that instances are not, nor ever will be wanting of failure, and of failures such as some have thought proper to depict, as the *dreadful effects of a cruel operation*. But even the simplest operations may be the forerunners of dangerous disease, if the subjects of them are neglected, or mis-treated; and, knowing this, should we find that horses of this description have been regularly hunted during whole seasons, indiscriminately used as hackneys, and put to work in coaches and post chaises upon the *pavé*, or roads equally hard and uneven, all which is in direct incompliance with the instructions received by their owners, are we to feel surprised at some unfortunate issues, or to decry the operation on their account? But to shew how far many of these animals are relieved, and how great are the advantages reaped by their possessors, Mr. SEWELL has received the following gratifying communications, accompanied with the assurance, that many horses operated on, performed as well as ever they had, when they were in a state of soundness.

In a Manchester caravan several of these horses ran, in

heavy draught, for upwards of two years, at the rate of six miles an hour, between London and Barnet: said to be one of the most laborious stages on that road.

A postmaster, who had had several of his horses operated on, sold them at the expiration of the season of employ, (during which time they had been in regular work with others,) and informed Mr. SEWELL, that he received from £18. to £25. for each, though he valued none of them at more than £3. prior to the operation.

Also in the York and Layton coaches, some have run for more than two years, (in the course of which time they have travelled many thousand miles,) with perfect satisfaction, and no little profit to the proprietors, after having been given up as utterly useless, and destined to slaughter.

To pass from these reports, which may serve as instances of what such horses are capable, and of the space of time we may calculate to continue them in laborious employ, and, above all, in work attended with much concussion and occasional contusion of the joints and sensible parts of the foot, and to take a still more pleasing view of the practice of neurotomy, let us, for a minute, inquire if any and what benefit has accrued to the army from it? And we can state here, that the veterinary surgeons of several regiments of cavalry, both at home and abroad, are ready to testify, that many horses, belonging to their respective regiments, have been retained in the service, and thereby the expence of purchasing others saved, in consequence of having been subjected to neurotomy. In none, perhaps, has it been more successfully practised abroad, (and to the credit of their veterinary surgeons be it said,) than in the 12th Lancers, and 18th Hussars. Soon after the disembarkation of the latter re-

giment from the continent, an order was received to draught and sell about one hundred of their ineffective horses: after the selection had been made, it was remarked, *that not one of the horses that had been operated on appeared among the non-effectives.* In the Royal Artillery, out of three that have been neurotomized, a very fine horse has recently been cast, who would otherwise have been sold two years ago, the period of his being subjected to the operation: during this time, therefore, he has been serving in the place of one that must have been purchased of the dealer*.

In the Hanoverian cavalry also neurotomy has been practised; and we are informed that it continues to be so with success.

These facts, collected from quarters to which access is open to us all, leave, we should presume, no doubt in the unprejudiced mind of its application in a military point of view, and of the policy of such a practice as a measure of public economy: indeed, "did it but render horses serviceable for one campaign only," as one of our most distinguished generals of cavalry observed, "it should still be considered as of national utility."

We find by reference to Mr. Goodwin's *New System of Shoeing*, (page 89,) that neurotomy has been introduced into the king's stables; and we have understood from that gentleman, that the royal establishment has, in several instances, derived peculiar advantages from it: we say *peculiar*, for here it has restored horses of *such* value, that their loss could not easily have been repaired. Mr.

* In the dragoons, horses of this description have been transferred, either in consequence of reduction, or departure for India, from one regiment to another: this was the case in the 13th Light Dragoons.

GOODWIN is at issue with Mr. SEWELL as to the place of operating; and we are inclined to believe, that the latter gentleman attributes some of the failures particularized in his publication to this circumstance: but, from the inferiority in number, and consequent variety of our cases, when compared with those of the assistant professor, we have no doubt Mr. GOODWIN will, with us, see the propriety of conceding a point we must at present contend under such manifest disadvantages.

Our discoverer has not probably yet ascertained to what extent neurotomy may, one day or other, prove beneficial: he tells us, that he himself, by operating in the usual manner, averted a locked-jaw from a horse in which tetanic symptoms had shewn themselves from disease in the foot; and we will leave it even to his opponents to say, whether the two following remarkable instances of its good effects, (the one Mr. SEWELL's own, the other communicated to him by a very respectable practitioner,) do not evince the truth of this assertion.

It was found, that a mare, given up as a breeder in consequence of being incurably lame, was not visited by the ordinary periodical *œstrum* for the male; but that the venereal desire returned in due season, as soon as she had undergone this operation. No doubt, it was the habitual pain the animal felt, that deprived her of healthy and natural feelings; and if this was the theory of the operator, we highly commend him for it, and consider the thanks of the breeder due to him for so valuable a hint. Last of all, we will venture to affirm, would the neurotomist think of handling his knife in a case of this kind; and we will ask Mr. SEWELL himself, flattering as that gentleman's views may have been when he first practised the operation, whether such a prospect had ever presented

itself, as to render the barren female, by it, again susceptible of impregnation?

The other case we allude to, scarcely less worthy of mention than the former, to which indeed it bears much analogy, is this. A stallion of some celebrity, a cripple before, in consequence of lingering and continual pain in his fore feet, became at length so reduced in condition, and lost so much of his wonted energy, that all desire for the female left him; so that mares brought to him in the season for covering, were taken away again unnoticed. It was suggested, that neurotomy be performed; and the suggestion proved not only most creditable to its author, but happy in its result; since the horse was reinstated by it in good health, and again enabled to perform his copulative functions with all his accustomed vigour.

Some have had recourse to neurotomy, and we think justifiably, in canker. Supposing the case to be inveterate, and there be found, as there almost always are, considerable trouble and difficulty in applying the dressings, we would, without hesitation, recommend the practitioner to divide the nerves going to the foot: pain being removed, the animal will make pressure upon the diseased parts, and thereby much accelerate the healing process.

Lastly, we may make mention of a case which has opened the door for the introduction of neurotomy into human surgery: whether the practice suggested itself from its high veterinary repute, or not, we will not pretend to say; but as the case is a novel one, we have subjoined the particulars of it in a note*.

* The subject of this operation was a man who had a large, spongy, bleeding ulcer of the leg, attended with such excruciating

It would answer no end to detail here individual cases, whether fortunate or unfortunate in their issue: our de-

pain that not only was he deprived of rest at night, but was often obliged to get out of bed. At length, from profuse hemorrhage and excessive pain, the case became so alarming that there was little prospect of saving life, unless the limb was amputated. The patient worn out by the terrible anguish he endured, resolved to make this sacrifice, but, says Mr. Swan, "knowing that the branches of the external popliteal or fibular nerve were the principal cause of the pain, from their connection with the ulcer; I determined first to give him the chance of saving his limb *by cutting out a portion of the nerve.*" This operation—neurotomy—was performed in the way we have here recommended, and the edges of the wound brought together with adhesive plaster and bandage. After the nerve had been divided, the pain in the ulcer entirely ceased, and he had no feeling on the top of the foot when it was touched. Two days afterwards sensation became perfect again in the upper part of the foot. On the third day there was pain in the ulcer, which he referred to the tightness of the bandage: it went off again. Eighth day, wound united by the first intention. After the operation he never had any spasms in the limb, nor any of the violent pain which followed the course of the sciatic nerve, and caused so much suffering. His state was rendered much more comfortable by the operation, but he at all times suffered pain from the connection of the saphenus nerve with the ulcer. Though he appeared to improve in health for a time, subsequent exfoliations were followed by such a decline of it, that amputation became necessary two months after the operation. After this, he continued in good health for three months; when he caught cold and died of pneumonia. On dissection of the limb, the nerve that had been divided was enlarged and much thickened: the nerves in the vicinity were also enlarged, and received some *new* branches from the divided extremities of the other; "and I think it not improbable," says our author, "that some other branches forming a medium of communication between the divided portions of nerves, might have been destroyed in the dissection."—"Whether the new branches had much power in conveying the nervous influence, I cannot determine. About a fortnight before the amputation of the

ductions must be made from the largest collection of well authenticated facts, by them alone our opinions adopted, and by them alone those opinions maintained. We are not to listen to this, or to that individual, whose practice, however successful, has been comparatively limited, to pay attention to any theoretical doctrine, or to lend an ear to the pleaders of humanity; but we are to pursue that course, which their experience has pointed out, on whose veracity and judgment we can rely, and who have a professional reputation at stake.

The greatest difficulty we encounter, is a judicious selection of subjects: and here the investigation of the nature, seat, and duration of the lameness, and the proba ble event of such an operation, are, above all other considerations, to be attended to. But, be the case what it may, observe, *we* do not propose neurotomy for the incurably lame, but restrict it to the incurably lame and *useless* horse; though, where but one leg is diseased, and under some particular circumstances where both are, we may and do deviate from this general course: like the surgeon who refuses to operate for cataract before his patient has lost all useful vision, by thus limiting our views, we shall never incur reproach, even though a failure be the result.

Furthermore, we would lay down the following rules for guidance in practice:—

1*st*. Any kind of *chronic* lameness about the foot, or coronet, with the exception of that arising from pumice-feet, may require the operation.

limb, I pressed on the part where the nerve was divided, and the patient said he felt it quite down the leg." *Observations on some points relating to the Anatomy, Physiology and Pathology of the Nervous System, by* Jos. Swan, *Member of the Royal College of Surgeons, &c.*

2nd. Should inflammation be present in the foot, pasterns, or fetlock, it is always to be reduced prior to the operation.

3rd. If we suspect ulceration of the joints—of the ligaments, tendons, or articular cartilages, we should not operate; since neurotomy will aggravate the disease, by enabling the animal to make use of parts, unfit, in their present condition, to bear either pressure, or motion.

4th. Neurotomy succeeds best in those cases in which lameness is accompanied by an alteration in the form and texture of the hoof, (pumice-foot excepted,) and where all previous disease has terminated in this: indeed, to some horses lame from anchylosis, partial or complete, it seems often to convey permanent benefit, by inducing them to exert these parts more, and thereby obtaining, in process of time, some small degree of useful motion in joints before stiff and immoveable.

Mr. Sewell finds, that in cases of entire section of a nerve, sensation returns in about two months; but in others, in which a portion of nerve has been excised, that the period of restored feeling can by no means be foretold: in one of his own horses, he ascertained that there was no sensibility in the foot even at the expiration of three years; and in some others, after a longer interval, the organ appeared to be wholly destitute of it. The cast horse belonging to the Royal Artillery, of which we have lately made mention, evinced as much feeling as any other would have done, whenever we pricked, with a pin, either of his fore feet: this was after an elapse of two years. Whether lameness invariably returns with the restoration of sensation, is a question we cannot

decide—it must so much depend on the nature of the case *.

Mr. SWAN, from whom we have both in this and the last lecture taken the liberty to transcribe on this subject, says, in relation to this part of it, "that when a portion of nerve has been removed, the restorative process is set up in the same way as when there has been merely a division of the nerve ; but the extremities of the divided portions afterwards present such appearances, as to lead to a supposition that the nerve will never again be restored." This had almost induced Mr. SWAN to believe so, when the case of a horse occurred to him, that had undergone neurotomy; in which the lameness returned in six months after the operation. But as lameness might have proceeded from other causes, independently of disease in the foot, its return is not to be attributed, without a minute inquiry into the nature of the case, to the restitution of feeling. So far from agreeing however with Mr. SWAN's informant—that "this is not *usually* the case where so large a portion of nerve has been removed," we believe that in the generality of instances sensation is only lost for a time ; but to this time we cannot at present set precise limits. How far the process may be accelerated *by irritation from disease in the foot*, we do not know—in truth, we do not very clearly see the connexion between them.

We cannot refrain, before we close this subject, from again enforcing attention to that injunction which is to direct us in the selection of subjects. *The incurably lame and useless horse*, is him alone for whom *we* recom-

* It appears to be less likely to return in cases of contraction, than in affections of joints.

mend it; our object being to render an animal serviceable during the remainder of his life, who, otherwise, must have been given up, as utterly valueless, for slaughter. None who have given the subject of neurotomy the least reflection, could conceive that the operation was ever intended to supercede other remedies; the very nature of it is such, that, as a dernier resource, it is only applicable to a desperate and hopeless case; and if it succeed in restoring one of this description, it is of more value and consideration to us, than if it was only applicable to such as we can relieve by other and simpler means. In concluding, let us remark, that we do not recommend such horses being *raced, hunted, or put to any other extraordinary exertions:* they may be driven in harness, and are more especially qualified for four-wheeled carriages, or leaders in others; in short, for situations where no weight is incumbent upon the body.

In this point of view—its objects being thus circumscribed, we dare prophecy, that neurotomy will be known as long as the veterinary art:—it has hitherto stood the test of this capricious age, and weathered out the storm of discordant opinion;—it has ranked high in the estimation of its more enthusiastic advocates;—it has fallen into disgrace and comparative dread with those who have misapplied it;—it has now to rise to a certain point in the scale of veterinary surgery, where it will remain in despite of all future controversy.

On the Diseases of the Nerves.

THE nervous system is much more subject to derangement of function, than to disease of structure; we understand so little however about its physiology, that we must necessarily be much in the dark in our theory

of its diseases: in truth, we know little of them but from their effects. Perhaps the most painful affection to which the human body is liable is *tic doloreux;* one that is generally believed to be a disease of the nerves, though, by some writers, the seat of it is referred to the brain; since no alteration of structure is ever perceptible in the nerves of the affected parts. One of the most formidable, as well as most incurable diseases of veterinary nosology, is that which we are now going to consider.

On Tetanus.

We have ranked *tetanus,* or locked-jaw, among the diseases of the nerves, in order that its effects may be better understood; though human nosologists, in general, treat of it as a cerebral affection, confessing however, one and all, that its real nature is still wrapped in obscurity. Instead of accompanying them into the depths of conjecture, as to the proximate cause of this fatal malady, it will be more consistent with our present views, to detail the symptoms by which it is known, examine the apparent causes that induce it, and offer such remedies, by way of treatment, as our own experience, and that of some skilful practitioners, have shown to be most effectual.

Tetanus consists in a spasmodic contraction, more or less general, of the muscles of voluntary motion, and especially of those that move the lower jaw: hence the vulgar name for it of *locked-jaw,* and the technical one of *trismus.*

An animal labouring under this disease, has little or no power over his muscles; so that he either moves the affected parts with considerable difficulty, or, in consequence of the severity of the spasm, is unable to move them at

all. Its attack is commonly gradual. The horse first evinces a degree of inflexibility of the neck, in moving his head, which is, in the course of a day or two, succeeded by so much rigidity of it, that he is unable to turn his head to either side, without at the same time moving his body and fore legs. The groom complains, that the animal does not eat with his wonted appetite, and that he either cuds his food, or appears to have some difficulty in swallowing it: this leads to an examination of the jaws, which are found either much restricted in their motions, so that you can only open the mouth to a certain extent, or completely *locked*—inseparably closed: under which circumstances, all your efforts to sunder them prove fruitless, so obstinately are the incisor teeth maintained in contact by the powerful spasmodic action of the *masseter* and *temporal* muscles. The eye is commonly the next object of attention: if, in efforts to elevate the head, we perceive the haw projected over the cornea, we may at once pronounce the case to be tetanus, though, as yet, no other parts than those we have named appear to be affected; and we have known one case in which the symptoms made no further progress—but gradually subsided, as if from the timely administration of our remedies. Most commonly, however, the disease advances, attacking other muscles in irregular succession, and with different degrees of severity. The limbs now, should they have escaped spasm in the primary stage, become so stiff, that progression is either rendered aukward and unnatural, or altogether impeded: in severe cases, both fore and hind legs are stretched out in different directions under the trunk, so as rather to resemble, in their position, the four props of support of a common form, than the limbs of a living animal. At this time, the back and loins

are shrugged up; the tail is elevate and tremulous; the hair on end; the ears erect; the eyes wild, and turned askaunt; the nostrils expanded; and the countenance altogether displays a degree of eagerness and anxiety not easily mistaken: in short, the poor animal exhibits a truly impressive and pitiable aspect, too characteristic of the state he is in to admit of the shade of a doubt. The spasm is not constant—it remits at intervals, so that the animal experiences some periodical mitigations of his painful malady: indeed, this explains that tremulous, quivering motion of the tail, so remarkable in this disease.

In consequence of the diaphragm being occasionally affected, respiration becomes unnatural: the motion of the flanks is quicker than ordinary, and is generally attended with some irregularity. The involuntary muscles, however, do not appear to be much influenced in tetanus; so that the pulse in the beginning is only either a little quicker than common, or remains altogether undisturbed; though towards the latter stages it will become accelerated and small, and sometimes irregular: and in respect to the bowels, though they be confined, their torpor is by no means such as would indicate spasm. But the pulse, though unaltered by the disease, acquires commonly such extreme irritability, that, if the animal be agitated, or alarmed in any way, it will often, on a sudden, beat with twice or thrice its former celerity, and then subside, with the alarm, into its natural state.

In this country, we should say that tetanus was a more frequent disease among horses than in the human subject: it is one of the most dreadful in the catalogue of those of the latter; and, if we may argue from the general analogy of the cases, none that we know of seems to produce equal suffering in the former.

This is a disease of uncertain duration. It commonly lasts for a few days, or a week, or two, and then, unless it previously end in death, gradually subsides; it may however be protracted much beyond this period: in either case, when the animal recovers, the spasms leave him slowly, and by degrees; so that it is often a very considerable time before he regains the perfect command of his muscles. When the attack has been severe, it leaves the horse much debilitated and out of condition.

Tetanus may arise from one of two kinds of causes: it may be a consequence of local injury; or it may be induced by some agent, whose iufluence appears to be on the system at large; and this has given rise to the division of it into *symptomatic*, and *idiopathic*. In the human subject, this disease is more commonly produced by wounds, especially of tendinous structure: thus a punctured hand, though it be a part remote from the brain, has frequently been the forerunner of a tetanic affection; and it has been remarked by surgeons, that tetanus originating from such cause, is more likely to prove fatal, than when it appears to have been spontaneous. In the horse we may often trace it to this source; and we are inclined to believe, that lesion of tendinous structure is most favorable to its production: whether this be true, or not, tetanus often supervenes on the operations of nicking and docking, and on punctures in the foot; though doubtlessly, as in the human subject, injuries of parts of a total different nature may give rise to it. In the generality of cases, the disease makes its appearance after the wound has healed. With regard to idiopathic tetanus, or that which appears without any very apparent cause, we have not the same well-authenticated testimony for referring it to sudden change of temperature, as writers on

human pathology can adduce: they have found it to be a disease more prevalent in hot than in cold climates, and one of rarer occurrence in Scotland than in England; and they have ascertained, that the most frequent cause of it in warm countries, is the application of cold to the surface of the body when heated. Notwithstanding even these facts, however, medical men are by no means agreed in referring it to such a cause; for if alternations of heat and cold induced it, we ought to have more frequent instances of it in this country. As far as our own observations have gone, horses in stables and at grass, both in summer and winter, are the subjects of it; we cannot, therefore, under such circumstances, agree with those who attribute it to cold; and we regard their opinions as still more hypothetical, who ascribe its origin to worms*.

We are very far from knowing what plan of treatment is recommendable in this disease: it most frequently baffles every mode of practice; though, now and then, it yields to a class of remedies, which, on repetition in similar cases, proves totally inefficacious; whereas sometimes the animal recovers, though nothing, or, (what is tantamount to nothing,) some inert remedies only be made use of. In those cases where symptoms of tetanus have followed nicking or docking, if the attack be recent, and still in an unconfirmed stage, we would most decid-

* At the Veterinary College, have lately been met with two fatal cases of tetanus, in which the cuticular coat of the stomach was extensively eroded; in one, indeed, few or no vestiges of it remained—the surface every where presented ulceration of the internal coat, and the muscular was twice or thrice its ordinary thickness. In one horse the disease was idiopathic; in the other, the sequel of a wound in the arm: in both, it was believed, that nothing but aloes had been administered.

edly recommend that the extremity of the dock be cut off with a sharp docking-iron, so as to make a new and clean wound, or even that the tail itself be removed —should it have arisen from nicking: in such cases, however, as are marked by considerable advance of the disease, little benefit, we fear, is to be expected from these means. In cases of punctured wounds, or others in which the external opening is but small, it is generally proper to enlage the outlet, by making a free incision; in doing which, it has been a laudable object of practice, in the human subject, to cut off all communication between the injured part and the brain, by dividing the nerves*. The actual cautery, and some of the most active caustics, may also occasionally be had recourse to with the same view. Should we not succeed in subduing the approaching spasms by the fulfilment of this—our first indication, *viz.* the removal of the exciting cause—of which indeed there is but too much apprehension, we are to proceed, without delay, to the general or constitutional treatment. While our knowledge of the proximate cause, or nature of this disease, remains clouded in so much obscurity, we are not to expect to institute a mode of practice grounded upon strictly scientific principles: most of our remedies are purely empirical, or such as have suggested themselves from the different views that practitioners of human medicine have taken of it. Some who have, and properly enough, regarded it as a spasmodic affection, have prescribed such medicines as are called *antispasmodics*, of which class opium is the chief: it has however failed in the majority of cases. Camphor and assafœtida have been

* We have made mention of a tetanic attack being averted in the horse by having timely recourse to this operation; but we are not in possession of the particulars of this case.

conjoined with it sometimes, but, and for obvious reasons, with no good effect; for both these medicines are totally inefficacious in the doses in which they are commonly exhibited. The cold bath, or what is the same in effect, the affusion of cold water, and the removal of the horse into the open air, should he have been attacked in the stable, has had some very staunch advocates, to whose opinion we would gladly subscribe, did not the result of our practice forbid it: all we have to observe further about the experiment, is, that we have failed in every instance in which the plan, usually recommended, has been adopted. Venesection has frequently appeared to confer considerable benefit; and though, like all the others, it has in too many cases failed to give relief, we should be inclined to place more dependance in this, than in any individual remedy with which we are acquainted; and in saying thus much, we think we are borne out in practice: indeed the supporters of the use of the cold bath themselves, seldom put much confidence in the sanative effects of cold without the accompanying use of the lancet. We would carry this practice further than is commonly recommended, and more especially in those cases where the pulse indicated any thing like inflammatory action in the system. Another remedy, in our humble opinion, only inferior in importance to the former, is the application of a blister to the skull, and whole length of the spine: for this purpose, let the hair be closely shorn from the skin covering the forehead and vertex, from the sides of the neck, directly opposed to the cervical vertebræ, from the lateral parts of the withers, and from the ridge of the back and loins, as far as the tail; having done which, apply a pretty thick layer of the common blistering ointment to

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the surface. In the course of ten or twelve hours, whether it have taken effect or not, clean the skin with hot water, and repeat the ointment; and this should be done, from time to time, as occasion may require: our object being to inflame these parts, and keep up from them a continual discharge*. In addition to these operations, we must procure evacuations from the bowels; and no medicine will insure this effect so well, as from one to two drams of calomel, combined with eight, ten, or twelve of aloes; according to the size of the horse, and the exigence of the case: and this we are to take care to administer as early as possible, lest the jaws become so fixed, that both food and medicines are inadmissible. Should this already have taken place, we may try to give a *larger* dose† of aloes in solution, and aid its operation by the frequent exhibition of copious glysters composed of this medicine in any emollient menstruum. *A loose stall*, or a well-ventilated box of large size, in which he can turn about loose without inconvenience, is the preferable habitation for the animal. Should his jaws be so locked as to render mastication either very irksome, or altogether impossible, attempts to drench him with water gruel, or

* At the veterinary college, it has of late been the practice to insert setons in the neck, back, and loins, in addition to the blister: for our own part, we prefer the frequent repetition of blisters.

† Not less than two ounces according to this formula:

℞ Aloës Vulg. Pulv. ℥ij. vel ℥iij.
Potassæ Subcarb. ℥i.
Acaciæ Gummi ℥iss.
Aquæ Ferventis ℔ j. Solve, et adde
Spts. Vini rectificat. ℥ij.

other nutritive fluid, should be frequently made, in order to support him under the worst stages of this awful malady. When the progress of the disease, from its onset, has not been rapid; when the spasm is not universal; and when its duration has become considerably protracted; we may cherish some faint hopes of the animal's recovery: under circumstances the reverse of these, however, we may look forward to speedy dissolution.

LECTURE XII.

On the Muscles.

MUSCLES are bundles of fleshy fibres, abundantly distributed over an animal body, for the purpose of producing motion of its several parts: *muscle* and *flesh,* in fact, are synonimous terms. The chief bulk of an animal is made up of muscle: every motion of his different organs, both external and internal, is either directly or indirectly effected by means of muscle; all his power of action resides in muscle; even the preservation of life itself is dependant on muscular motion.

We are not prepared to state the number of muscles in the horse; nor would such a knowledge prove of any utility to us: that in the human subject is estimated at about five hundred.

Muscles have been divided, according to the course and disposition of their fibres; first, into *rectilineal* or *straight,* as the rectus abdominis, and sartorius; secondly, into *half,* and *complete penniform,* as the vasti, and rectus of the hind extremity; thirdly, into *radiated,* as the obliquus internus abdominis, and serratus magnus; fourthly, into hollow, as the bladder, intestines, and heart.

Muscles have received various names, according to their shape, use, attachment, course, comparative size, &c. thus, we have the rhomboideus, trapezius, and quadratus, so called from their figure; the levator, depressor, extensor, and flexor, from their different uses; the supra et infra spinati, the intercostales, and sterno-maxillaris, from their situation and attachments; the obliquus, rectus, and transversalis, from the direction of their fibres; the maximus, medius, minimus, magnus, parvus, longus, and brevis, from their comparative size; the semitendinosus, and semimembranosus, from their composition. Our best writer on veterinary anatomy, STUBBS, has adhered, in his description of these parts, as nearly as possible, to the nomenclature made use of by human anatomists; and there are so many forcible objections to any deviation from this procedure, that we shall at all times adopt it, unless forbid by palpable inconsistency.

In describing the attachments of a muscle, it is found convenient to divide it into three portions, to which different names are assigned. That extremity from which it arises, commonly connected to some fixed, or very limitedly moveable part, is called its *origin*, or *head;* the other, implanted into the part to be moved, the *insertion*, or *termination* of it; while the portion intermediate—between its *head* and *termination*, receives the name of *body*, or *belly*.

Muscles are composed of two substances altogether different, both in regard to their structure and use. The chief part of a muscle, (of some the whole,) is constituted of fleshy fibres, whose color, commonly red, is wholly dependant on the quantity of blood they contain; for if these red fibres be steeped, but for a short time, in water, they may be rendered perfectly white. Indeed,

redness is by no means essential to these organs, for many of them are entirely colorless; which we have instanced in the stomach, the bladder, the intestinal canal, and the muscular coats of arteries; and yet these parts are similar, both in structure and economy, to the red and larger muscles of the body. We know also, that in many fish, the muscles are white; and we have a good specimen of the same, in those of the breast and wings of our common domestic fowl.

The fleshy part of these organs, we have said, is fibrous; and their fibres are disposed in packets or bundles, called *fasciculi*, which run in lines parallel to one another, and are connected together by cellular membrane. At first sight, these fasciculi, or fleshy packets, appear to be of large size; but if we proceed to unravel them, we shall find that the fibres of which they are made up, are composed of numerous *fibrillæ*, or smaller fibres, and that they themselves are so many fasciculi: these again, by prosecuting the examination, will be found to be divisible into others still more minute; so that, in truth, the ultimate fibre of a muscle cannot be discovered. The fasciculi are much larger and coarser in some muscles than in others: *e.g.* in the gluteus maximus, a muscle of the buttock, their texture is extremely coarse, whereas in the small muscles of the eye it is remarkably soft and fine; and even the cellular membrane, by which they adhere together, varies somewhat in its tissue in these parts. It is for this reason, that some joints, and also parts of joints, of beef, mutton, &c. are much tenderer, and better flavoured than others; and therefore commonly preferred for the table.

The fibres of what are called the involuntary muscles, are in general of finer texture than those of the voluntary,

as well as shorter, and extremely irregular in their course: *e.g.* the heart is composed of strong and red, but by no means coarse fasciculi, which, from running in all directions, enable it to contract its sides with considerable effect; and the bladder and stomach are furnished with muscular fasciculi, pale, and slender, and alike differently disposed.

Various conjectures have been offered, from time to time, as to the ultimate structure of these minute fibres; but physiologists have not as yet come to any definite conclusions on the subject. It is generally admitted, that they resemble in composition the fibrine of the blood, that they are disposed in straight lines in regard to one another, and that they are inelastic; for though muscles appear, when stretched, to possess some elasticity, it is a property they owe to the cellular membrane connecting their fasciculi together, and not one inherent in their component fibres. The opinions, that their primitive fibrillæ are the continuations of the extremities of nerves—that they are composed of cells, or hollow tubes, or vesicles, are now altogether rejected; as well as the suppositions of their being, in figure, globular, rhomboidal, &c.

The fleshy part of a muscle is extremely vascular. Though small, its arteries are so numerous, that some authors have thought that the blood which they contain, not only served it for nourishment, but had some share in the performance of its functions. Their veins are proportionally abundant.

Their nerves are small, and ramify extensively in their substance: lymphatics also have been seen in them in considerable numbers. Muscles however are not very sensible parts: when cut, in experiments on living animals, although their fibres contract as soon as divided,

and appear to shrink under the knife, we never find any very considerable pain evinced by the animal at the time; and, in amputation, surgeons have remarked, that their patients, generally speaking, complain but little after the division of the integuments.

On Tendons.

TENDONS are to be regarded as parts of, or appendages to muscles. They were formerly supposed to be made up of fibres continued from the fleshy part, more closely compacted; this opinion, however, though, at first view, plausible enough, has been withdrawn, since their composition and texture have become the subject of more accurate examination. It is now ascertained, that tendons, though fibrous, are, unlike muscles, chiefly convertible into glue by long boiling; and that their fibres, in many instances, are taking a different direction altogether from those of the muscles to which they belong: the most obvious distinction, however, between muscle and tendon, and one which sets this question at rest, is that of function, as we shall hereafter have occasion to point out.

The fibres of tendons are white, glistening, and inelastic, and possess but little vascularity when compared with those of muscles: hence arises their disposition to slough—not a very uncommon effect of injury to them in the human subject, even as high up as their origin from the muscles. Nerves cannot be traced into them, and animals express no pain when they are injured*: but the *thecæ*,

* Although tendons appear to have no feeling in health, they are (or at least their granulations are) very sensible in disease: we have shown this by pricking and cutting the extensor tendon, divided, or

or sheaths investing them, possess sensibility; and it is from this circumstance, that inflammation from sprains of these parts, is productive of so much pain. Absorbents in tendons are very scarce; for which reason, ulceration in them is an exceedingly tedious process: so that if matter be poured forth under a tendinous faschia, unless we discover its presence in time, and give it free issue by puncture, it will burrow among the muscles, or other soft parts, and produce extensive mischief; whereas, had it been collected under the skin, ulceration of the integument would have readily discharged it, without any surgical assistance.

Tendons are of different forms—either round, flat, expanded, or bifurcated—and are continued from the bellies of muscles to bones, and other parts, into which their fibres are implanted. They are, in general, enveloped in thin membranous, or cellular sheaths; though in some parts they have *thecæ* of similar composition to themselves; as is the case with the tendo perforans, which, at the fetlock, is enclosed within a theca formed by the tendo perforatus.

The use of tendon is to connect muscles to those parts destined to be moved by them. Sometimes it serves to give greater strength to them at their origin. In some places, more particularly in the extremities, by occupying less space, tendon preserves the symmetry of parts, and allows of more extensive action: for this reason, we seldom see any thing but tendon passing over a joint. Were it not for such an admirable and convenient substitute for muscle, the legs would be as thick as the arms and thighs,

partially so, in cases of *broken knees:* the animal withdraws the limb as often as this experiment is made, and commonly evinces considerable feeling—we have had occasion to make this remark already, in a former lecture.

and consequently not only very unsightly, but incapable of many of those movements which they now perform with the utmost facility.

A *faschia* is an expansion, commonly of tendinous structure, which serves to bind down the muscles, chiefly of the extremities, and prevent displacement of them when in action. If a man have to raise a heavy weight, he frequently makes use of some artificial bandage around his arm, by which he finds his muscles so supported, while in action, that he is enabled to perform the labor with less effort: this explains the chief use of faschia.

On the Diseases of Tendons.

TENDONS are subject to inflammation in consequence of sprains. Those of the flexor muscles of the fore legs are commonly the seat of this injury: in them it is described, in most works on farriery, under the head of "sprain, or clap, of the back sinews." In investigating the nature of this accident, we wish to confine ourselves to the injury sustained by the tendons themselves, and not complicate it with that of many other parts in the vicinity, which, the least reflection will show, may, and very often do partake of it in severe cases of this kind.

What is called a sprain, or strain of the flexor tendons of the leg, does not, in the generality of cases, consist in any preternatural extension of those parts, but in a laceration of that cellular membrane which connects them together, and of which the thecæ for them is composed, in their passage between the knee and fetlock-joint. We do not mean to contend, that in the worst accidents of this kind the tendons may not be stretched, and even partially ruptured; but we would reject the accounts of writers altogether, in reference to their being *torn asunder*, as wholly

unsupported by the actual inspection of these parts, and thus far disbelieve that a horse was ever *broken down.* Professor Peel, who has no competitor as a veterinary pathologist, in his work on the *Diseases of the Horse*, says, "I am strongly inclined to believe that the rupture of the back sinews in horses, is a very rare occurrence indeed, although I am far from denying the possibility of such a circumstance." In the human subject, it is true that the tendon of the heel is not unfrequently broken; but only reflect, for a moment, on the comparative size and strength of the tendo achillis and the gastrocnemii muscles, and then turn your attention to the flexor muscles and tendons of the horse! Moreover, in dancing or jumping, the gastrocnemii of one leg are often absolutely sustaining the weight of the whole body; but do the flexors of a horse ever do this?—muscles that are not even *believed* to be concerned in progression. Lastly, we have appended 2 cwt. to the tendo perforans without rupturing it. From these facts, then, and from some others that might be adduced, we would even deny the *possibility* of rupture of the flexor tendons in a sound and healthy condition.

As laceration of the cellular membrane must, in most instances, be accompanied, not merely by extension, but by rupture of its blood-vessels and nerves, the immediate effect of this accident will be more or less extravasation of blood; and this accounts for the swelling, and (by its pressure upon the injured nerves) for the tenderness, often perceptible soon after it has happened: we sometimes meet with cases, however, in which we cannot discover tumor, or tenderness; but in them lameness seldom appears prior to the supervention of inflammation. When the sprain has been violent, extensive tumefaction of the

back part of the leg immediately ensues, attended with considerable pain—if we may estimate it by the limping gait of the animal, as he is led to the stable : quickly after inflammation supervenes—the parts become hot, more swollen, tense, and exquisitely sensitive ; and the horse projects the limb a little, stands tottering with it upon the toe, and keeps the heel elevated. About this time, the system sympathizes from the extreme pain in the part, and symptomatic fever is ushered in :—the horse grows dull and languid, his flanks heave, his pulse becomes accelerated and strong, and his mouth feels hot and dry ; and to such an alarming degree may these symptoms increase, that, if the animal be not in some way or other relieved, even death itself may step in, and put an end to his sufferings.

Sudden and violent exertion of any kind, and more especially at a time when the animal is unprepared for the shock, is the exciting cause of this disease : racers, hunters, and such horses as are ridden hard on the road, are the most common subjects of it. Hard galloping upon boggy ground—unexpectedly leaping into a blind ditch—or setting the foot on a sudden in a rabbit hole, frequently produces it. Perhaps the improper use of thin-heeled shoes, and the imposition of more weight than, from age or conformation, the animal is able to carry, may now and then have the same effect.

The treatment of a slight sprain is very simple. If the leg be but little swollen, and the lameness inconsiderable, the use of some refrigerent, or evaporating lotion *, with a well applied bandage, will be all that is required ; or—

* Either the Liquor. Plum. Subacet. Dilut. ; or that in combination with Vinegar, or Spirits of Wine.—Vide Lecture V. *Local Treatment of Inflammation.*

a practice some prefer, immerse the leg in spring water, and let the horse stand up to the knee in it for several hours in the day, using the bandage and cold wash only during the night. When there is much heat, swelling, and tension of the leg, however, our treatment of the case must be more active. In the first place, we are to draw blood to the amount of from four to six pounds; and this we can always do, with as much effect as locally, by removing the horn at the toe and puncturing the anterior coffin artery, or opening the cephalic, or saphena vein, according as it is the fore or hind leg affected. We should also at this time exhibit a full dose of purgative medicine*. Emollient applications are here to be preferred to cold: fomenting the leg with warm water, or, what is more effectual, steeping it in the same manner as that in which we have recommended the use of the cold, will tend much to the reduction of the inflammation, and considerably alleviate the animal's sufferings. When the heat and tenderness have much abated, we prefer immersion in cold to warm water, or have recourse to the evaporating lotion and bandage; taking care, however, not to apply the bandage tightly, until the animal can bear moderate compression of the leg with the fingers. Rest is indispensable: it is an erroneous practice to turn horses into loose stables at the onset of this disease; though it is of great service to them when the inflammatory action has subsided; which you may determine on by the feel, and by the animal's *walking* sound.

Nothing is more common in aggravated cases, than for

* ℞ Aloës Vulgar. Ext. ℥vij.
Ol. Carui gtt. xl.
Syrupi q. s. ft. Bol. for a horse of ordinary size.

much obstinate swelling and induration to remain after we have entirely suppressed the inflammation. Tumefaction in the beginning is simply the effect of a coating of adhesive matter, filling up the cellular substance between the tendons and the skin; as soon as the case has turned chronic, however, a gradual change takes place—the effusion becomes organized, and firmly adherent to, and continuous with the surrounding parts, whose nature, ultimately, it partakes of; gluing the whole together into one solid mass, tightly binding down the skin, and more or less impeding the motions of the ligaments and tendons: and now we perceive why horses continue lame, and sometimes irrecoverably so, after all heat and tension have disappeared. In order to remove this adventitious deposit, we may first try some discutient*; and, at the same time, if the season permit, turn the animal into an open paddock for a few hours in the course of the day. Should this thickening, however, not readily give way, the application of a blister, and its repetition about every fortnight, or three weeks, will generally promote absorption of it. In old, or prematurely-worked-up roadsters, hunters, and racers, whose legs have failed from repeated and aggravated injuries of this nature, we should, generally speaking, after having reduced the existing inflammation by the use of some of the aforementioned remedies, make frequent use of blisters: we wish to enforce this, in order that time may be given to the parts to recover their wonted condition and tone, while we are assisting them to do so, by refraining from all further violence, and exciting the ab-

* ℞ Ammon. Muriat. ℥ss.
Acid. Acetos—Spts. Vin. Ten. *ana* ℥viij. M.

Some to be rubbed upon the leg; and a bandage wetted with it, kept tightly applied.

sorbents to remove the interstitial effusion. The common practice in these cases, more particularly with farriers and gentlemen horse-doctors, is to fire and blister. Now, we will not ask these individuals—but we will put the question, seriously and conscientiously, to any veterinary surgeon, whether these remedies are required at the same time—whether there is such an affinity between a red hot iron and an ointment made of cantharides, corrosive sublimate, and lard, that the first can on no occasion be had recourse to, without being followed up by the last? With the intention of gaining a clear view of this important subject, it is desirable that we should be made acquainted with the *modus operandi* of the actual cautery, which appears to us to have been in part overlooked. First, the cautery extinguishes the life of the part to which it is immediately applied; secondly, as a direct and powerful stimulant, it excites inflammation; thirdly, eschars appear—the dead parts scale off; fourthly, furrows, where the skin is deficient, remain to granulate and cicatrize: there is also more or less interstitial effusion. The fourth and last effect of the cautery will explain its ultimate and most beneficial operation—as a bandage; for Nature here does not form new skin—no! that would be an expensive and tedious process; but She contracts the cauterized edges of the old to restore its integrity, and, in doing so, braces the parts underneath with much more effect than we could by the best contrived bandage. Seeing, then, that excessive stimulation and perpetual pressure are the principal effects of the actual cautery, and knowing that those of an escharotic blister are excessive stimulation and serous exudation from the surface*, we cannot discover, we repeat, the intimate relationship between them. For the present,

* Vide Lecture IX.

we will leave the subject here—we fear, we have said enough to kindle the wrath of those whose opinion we will not ask, if not to raise up in arms against us some of our veterinary colleagues: influenced however by a desire to improve our art, while we avoid all unnecessary torment in the practice of it, we trust that no misconstruction will be coupled with our motives.

We are not to make use of the cautery so long as blisters seem adequate to this end; (which indeed we have very commonly found them to be;) and when we do, we are not to handle it as if its efficacy was in direct ratio to the depth to which the skin is scored: a mode of practice in great repute among farriers, and one as tenaciously persisted in, we lament to say, by many veterinary surgeons. The performance of this operation in such manner as to make the lines penniform, commonly called *diamond, or feather firing*, "has," as Professor Peel justly remarks, "nothing but its fancifulness and antiquity to recommend it," for, in our opinion, it evinces but little of the dexterity of the operator, and much less of his professional judgment.

Without again agitating the question of the propriety, or necessity, of simultaneous firing and blistering, we may contend, however curative it may be, that the practice is dangerous, and therefore impolitic. No man ever fires and blisters his horse all fours without a remote chance of killing him. Two cases of the kind have occurred to us, in one of which, indeed, only the fore legs were operated on; but we have had several others related to us: the horse refuses his food, the legs become enormously swollen, inflammatory fever supervenes, sometimes the kidneys are highly stimulated, and the poor animal dies in the height of irritation. In hunting and racing stables this

occurrence is not very uncommon; though it is mostly veiled in some flimsy narrative, by which the proprietor and practitioner in attendance alike escape a merited reprimand. But the practice is so general, and the case, it would appear, so well defined in which it is proper, that even if the owner of the horse should not prescribe himself, the representations of the groom are seldom unavailing; so that many hunters and racers are thus inhumanly tortured once a year, whether they require it or not, not only with a view of remedying present mischief, *but of preventing that which is to come!*

We would here suggest to the practitioner a plan, which, if properly pursued, will prove of no inconsiderable service in all cases of lameness from sprains, or laceration of the fibres of the flexor muscles, or tendons. It consists simply in the elevation of the heel by some additional substance, either of a temporary or permanent kind, to the heels of the shoe. In all cases likely to prove protracted in the cure, we should recommend the shoe being removed, and raised by calkins at the heels to the extent of about an inch; in others of less severity, the practitioner will be best able to form his own contrivance. Should a high-heeled shoe have been long worn, we must not diminish its thickness at the heel suddenly, nor succeed its application by the immediate use of a common one.

On Bursæ Mucosæ.

The *bursæ mucosæ* are small membranous sacs containing fluid, interposed between certain parts moveable upon each other, to facilitate motion.

They may be considered as appendages to muscles, or rather their tendons; for it is between tendons and the parts over which they pass, that we commonly find them:

hence they exist in great numbers in the extremities; either between the tendons themselves—as between the flexor tendons of the legs; or between the tendons and their thecæ—as in those of the hock, fetlock, and knee; or between tendons and cartilaginous surfaces—as between the os naviculare and tendo perforans, and within the cap of the hock; or between tendons and joints—as in the knee, shoulder-joint, and stifle. Sometimes we find them placed under the fleshy part of the muscle, in order to enable it to glide smoothly over some cartilaginous surface: *e.g.* under the antea et postea spinati of the fore extremity, and the gluteus maximus of the hind.

These bursæ are formed of thin tendinous sacs, lined by a delicate membrane similar in its texture to the synovial membrane of a joint; which, like it, secretes and contains a viscid fluid, resembling in appearance the white of egg. They are connected to the surrounding parts by cellular membrane, so that (as they are circumscribed) they may, by a nice dissection, be wholly detached; and indeed they are occasionally, by operation, excised altogether, in consequence of being diseased.

In a physiological point of view, the bursæ may be regarded as so many small, distinct capsular ligaments; and being, for the most part, situated between firm and unyielding substances, moveable upon one another, they facilitate motion by preventing friction, and preserve these parts from the injurious effects of it.

On the Diseases of Bursæ Mucosæ.

THESE parts, both in the human subject and in horses, are very frequently diseased: indeed, so common are these cases in veterinary practice, that, perhaps, we are oftener called on to treat them in one part or other, than any other

individual local affection. Different names have been used to denote this disease, though the nature of it is precisely the same in all, according to the situation of the affected bursa, or bursæ: *e.g.* if those about the fetlock joint are diseased, it is called *wind-galls;* if those about the hock, *thorough-pin,* or *bog-spavin;* or, if it is that within the cap of the hock, *capped hock.* Now and then, we meet with puffy swellings precisely of the same nature upon the knee; but to these no specific appellation has been given, in consequence, probably, of their being of comparative rare occurrence.

If we inquire, by dissection, into the nature of this disease, we shall find that it consists in the distention of one or more of these tendinous sacs with an albuminous fluid, resembling synovia. Inflammation is first excited in the membrane lining the bag, the effect of which is an accumulation of its secretion: this, in course, preternaturally distends the cyst, and thus the disease in question is produced. These encysted tumors may, and do form in some parts, without our being aware of their existence, until they have acquired a certain size, which will depend on their relative situation: as soon as they are large enough to make their appearance externally, they are known as puffy swellings, possessing elasticity, and a sense of fluctuation when compressed by the fingers. Occasionally these swellings grow to an enormous bulk, and then commonly interfere with the functions of parts to which they are contiguous. They are, in the first instance, like healthy bursæ, perfectly circumscribed—have no communication with any other cavity; it frequently happens, however, that wind-galls and thorough-pins of long duration, from internal absorption, open into the ca-

vity of the joint. The fluid contained in them also undergoes some alteration during the chronic stages.

These tumors are commonly the result either of some injury to ligamentary or tendinous structure, or of improper usage of these (as yet imperfectly formed) parts: overweighting, immoderately riding, or injudiciously breaking young horses, are among the most common forerunners of this disease. In horses more advanced in life, repeated acts of violence to these parts from long and forcible exertion—from what is known as *hard work,* is the most common cause of them; though sprain, or other injury, may occasionally produce them. Sometimes they arise from blows; the best instance of which is the capped hock.

As the bursæ mucosæ are not very sensible parts in health, we do not find that pain, or lameness, (the effect of pain) is a common symptom of disease in them: in those cases, however, where the magnitude of the swelling is such as to interfere with the motions of contiguous parts, lameness may result from that cause alone.

Remedies of various kinds have been from time to time recommended for the cure of wind-galls. In the human subject, the treatment of a ganglion (for so the swelling is called) is exceedingly simple: if it be of small size, merely giving the part a sharp blow with a book, or some such thing, in order to rupture the sac, and extravasate its contents into the adhering cellular membrane, where in the course of a short time it will be absorbed, is all that is necessary: but in horses, their size and situation generally preclude the probability of success by these means. Puncturing them, or laying them open in order to remove the cyst by excision, or to destroy it by the introduction of caustic, has been recommended by several old

writers*: knowing, however, as OSMER appears to have done, the nature of these swellings, we are somewhat surprised that he should have condemned all other remedies, for the introduction of one, not only very difficult, in many instances, to put into practice, but at all times more or less hazardous, from the intimate connection, if not communication, which these swellings so commonly have with the cavity of a joint. If either of these operations is ever to be performed, it should be attempted in some part remote from a joint. Setons are objectionable for similar reasons.

As our principal object in the treatment of these affections, is to remove an eyesore, (for, as we have before mentioned, they do not often occasion lameness,) those means commonly used to promote the action of the absorbents, have been had recourse to by most of the old practitioners in farriery. Pressure, either by means of sheet lead, or a bandage, is one of the most common; friction, by means of hand-rubbing, another: both, however, have generally been accompanied with the application of some evaporating or discutient lotion, to which the good effects have been chiefly attributed. And if the swelling be recent, and more especially if there be any concomitant inflammation of the parts in the vicinity, we cannot do better than apply a linen bandage, kept constantly wet with some mixture of a stimulating and discutient kind†: even here, however, we believe, as much depends upon the proper application of the bandage—nice-

* Vide BRACKEN, OSMER, TAPLIN, and others.

† ℞ Ammon. Muriat. ℥ss.
Spts. Vin. rect.—Acid. Acetos. *ana* ℥vj. M.

ly adjusting the turns of it to the irregularities of the leg —as to the lotion itself. This practice will seldom succeed in discussing the swelling, however effectual it may prove in the removal of the lameness: we are, consequently, to have recourse to other and more powerful means, if we be desirous to excite absorption of it. The use of stimulants of various kinds, is generally now resorted to: as the Ol. Origani, and Liquor Ammoniæ, either separately, or in combination with some inactive ingredients. But of this class of remedies, blisters are by far the best: indeed to their use we should at once betake ourselves, if we wish to obtain a speedy removal of the tumor; and either frequently repeat them, or keep up a discharge from the surface by means of some stimulating unguent. Last of all, we may employ the actual cautery, when other attempts to disperse it have proved ineffectual: a few longitudinal lines, lightly drawn upon the surface of the swollen part, will often promote the further absorption of its contents, when blisters cease to have that effect; but, then, it will require that the animal be turned out for about a month afterwards.

Though these affections have been here viewed as disease, we must not close this lecture without observing, that we rarely find it necessary to treat them: they seldom occasion lameness, and are not often attended with inconvenience. A windgall, if it be recent, and we dislike the appearance of it, may be got rid of: but it is ever prudent not to disturb those of older date. A capped hock is certainly a great deformity, and, as such, should invariably be treated; a thorough-pin, or a bog-spavin, is of less consideration as a blemish: like windgall, they are all to be removed by proper and timely

means, but commonly resist remedy, and may be regarded as permanent defects, when of long or uncertain duration. We shall have occasion to make some further remarks on these local affections, when our attention is engaged by the parts with which they are immediately connected.

LECTURE XIII.

On the Physiology of Muscles.

IN a former lecture, we stated, in our definition of a muscle, that all the motions of the body were either directly or indirectly the effects of muscular action. Now, though we are by no means warranted, from our anatomical knowledge, in taking up so extensive a position, still the inability of any other known power to produce such phenomena as happen in the moveable parts of the body, even where a fibrous structure is indemonstrable, leads us to conclude, that muscular fibres must exist, although they be so minute as to escape microscopical observation. Without prosecuting this abstruse question, we shall endeavour, in the present lecture, to point out some of those laws and phenomena at different times disclosed by physiologists, in the course of their inquiries after the mysterious causes of muscular motion.

Muscles in the living body possess the power of shortening themselves, so as to bring nearer to each other their points of origin and insertion: a power expressed by the term *contraction*, or, from its peculiarity of self-action in these organs, *self-contraction*. A muscle during contraction, at the same time that it is rendered shorter, becomes

thick and hard, and appears to swell: to convince ourselves of these facts, we have only to grasp the fore part of our arm completely extended, and then flex the fore arm to its utmost; and we shall feel the biceps flexor cubiti, (the muscle performing this action,) which was at first but indistinct, relaxed, and soft, become turgid, firm, and rigid under our fingers. Notwithstanding these changes, however, it has been ascertained, that there is no absolute augmentation of its bulk; for if the arm be immersed in a vessel completely full of water, when all its muscles are relaxed, no superflux of the fluid is occasioned by throwing them into action. The color of a muscle is not altered during contraction.

But muscles may be in action without being able to contract their extreme parts: as, for example, when we are attempting to lift a heavy weight, and are unable to effect it, all those muscles which would have contracted had the weight been raised, are still in strong action during our efforts to accomplish it. A muscle will act with more or less force according to the nature of the function we intend it to perform: if we prepare the muscles of our arm to lift a heavy weight, and in raising it find, contrary to our expectation, that it is very light, the hand, with the weight, will be involuntarily elevated, with a sudden jerk; and something of the same kind happens, when, in descending a staircase in the dark, we unthinkingly step down two stairs instead of one, or *vice versâ*. Under ordinary circumstances, a muscle cannot remain long in a state of contraction—its fibres must be relieved by intervals of relaxation: if we hold a weight out at arm's length but for a short time, we experience an uneasy sensation in the muscles of our arm, the effect of fatigue in them, and this will continue to increase until we find our-

selves no longer capable of sustaining it; but if we lay down the weight, and rest the arm for a time, and then raise it as before, we shall find ourselves as able to support it as in the first instance. Relaxation, therefore, is a state necessary for the recovery of muscles from fatigue, or the re-acquirement of that which enables them to contract as before. Even the heart itself has its momentary relaxations. It is curious to observe, when a muscle has continued long in action, how its numerous fasciculi will relieve each other, by alternate contractions and relaxations; which, as the fatigue becomes greater, occur in more frequent and irregular succession, producing that quivering motion so remarkable in a part whose strength is nearly exhausted.

A muscle, having performed its office, relaxes; and when relaxed, is completely passive: its belly becomes again soft, the swelling of it subsides, and its fibres may be readily elongated; in which condition it may be said to be at rest. Thus the biceps, which we employ to bend the arm, having done so, relaxes; though its fibres remain shortened, until the arm is straightened again by the action of the triceps extensor cubiti.

No alteration is observable in the tendons, either during the contracted or relaxed state of a muscle: they appear to be, as it were, substitutes for cords—to connect muscles to the parts intended to be moved, without impeding, from their volume, the motion of those joints over which they pass.

If a nerve be cut through, the muscles to which it is distributed become paralytic; or if that nerve be compressed from any cause—as from ligature around it, the same effect is produced: but if it be irritated, violent contractions of them, called convulsions, ensue. In like

manner, compression or division of the medulla spinalis, paralyzes all those muscles whose nerves are given off from it posteriorly to the section, or part compressed, and irritation of it convulses them; consequently, the more anteriorly along the spine this experiment is made, the greater the number of muscles influenced by it: if it be before the origin of the phrenic nerve, the diaphram is rendered paralytic, respiration arrested, and the animal dies.

The motions of these organs have been divided into *voluntary*, *involuntary*, and *mixed*. Of the first class are those of the muscles of the extremities, head, neck, and tail; of the second, those performed by the muscles of respiration; and of the third, the actions of the heart, blood-vessels, and abdominal viscera. The brain being the centre of all muscular motion, it is along the nerves that the will, or the requisite stimulus to action, is conveyed to the voluntary muscles: we will, for example, to bend our arm, and it is done; but if the nerves be cut through going to the muscles employed in bending it, we may will or wish to eternity, and no effect will be produced. It is somewhat different, however, with the mixed order of muscles: we may breathe twenty times in a minute, or we can make a hundred inspirations in that time, but we cannot suppress respiration altogether; for in spite of our most resolute determination to hold out breath, we soon experience so uneasy a sensation in the chest, that we are compelled to desist from the attempt. On the contrary, respiration is going on, without any remission, in such a manner that we are generally unconscious of it, unless our attention be immediately directed to it by any incidental circumstance; so that the actions performed in breathing, are strictly what they are said to

be—*mixed*, or in part voluntary, and in part involuntary. The motions of the heart and arteries, and those of the abdominal viscera, are entirely out of the limits of voluntary influence: and most wisely is it so ordained, otherwise we should possess full discretionary power to terminate our lives, by having control over the motions of the heart, and be in continual hazard of forfeiting our existence from inattention to them.

It is observed, that muscles increase in size and power, in proportion to the exertions they are in the habit of performing: hence is it, that the arms of blacksmiths are so well marked by fleshy prominences, and the calves of the legs of porters so much larger than those of others; and for the same reason, thorough-bred horses that have been in training, are admired for that plumpness and *cleanness* of their muscles by which the trainer knows that they are in condition *to go to work.* The power of muscles is much greater than we could have had any conception of, from a bare consideration of their texture and uses: though we have frequent opportunities of witnessing the astonishing feats of strength which horses and other animals are capable of, we seldom contrast them with the physical powers producing them. The immense burthens imposed upon the backs of little half-starved asses, with which they trip along without apparent inconvenience; the high fence and extent of ground over which a horse will project himself and his rider; and the mere elevation of the tail—which is often as much as a powerful man can effect with both hands—are familiar and striking instances of the force that these organs are capable of exerting.

We are not to imagine, however, that muscles act to the greatest advantage in the different movements of the

body; on the contrary, there is often much expenditure of force, resulting from their situation and attachment, in relation to the parts to be moved, being unfavorable to their mechanical operation: and this, in most instances, arises from their being connected to bones near to the centre of motion, and having to raise a weight at the extremity of a long lever, or from their terminations being implanted into them at unfavorable angles. The extensor and flexor muscles of the leg, which have chiefly to overcome the resistance opposed from the weight of the pasterns and foot, though they are inserted near to the top of the cannon, instance the first; while the proper extensor and flexor of the foot, which are tied down at the knee, and fixed at sharp angles into the coffin bone, serve to demonstrate the latter. If muscles were inserted in parellel lines with the bones, no motion whatever could be produced: they act with more effect in exact ratio, *cœteris paribus*, as their insertions approach to right angles; hence the extreme force with which the gastrocnemii extend the hock in progression*.

On the other hand, there are certain peculiarities of conformation in the parts to be moved, and of arrangement in the moving powers, which conspire to the favorable action of muscles. In the instance we have just adduced, the mechanical advantage afforded by the protuberance of the os calsis, is very great: the same adaptations of structure are observable at the elbow, by means of the olecranon; at the knee, through the in-

* Knowing this, we discover an important use of the navicular bone, not adverted to by writers on the foot:—to increase the angle of insertion of the flexor perforans, and to add so much the more power to it, in its action on the coffin bone.

terposition of the os trapezium*; and, we may add, in the foot, by means of the os naviculare. The pulley, another mechanical power, is one, it is not improbable, that first suggested itself from attention to the construction of the animal machine: the trochlearis muscle of the eye is a beautiful instance of this; the flexors of the pasterns and foot in the hind extremity are also, in their course over the hock, imitative of the same structure. Even the enlargements at the extremities of bones much assist the muscles in their operation, by making wider angles with their insertions.

The contractile force of muscles is so great, that in the human subject the tendons, and even the bones themselves into which they are inserted, occasionally give way: we have already shewn that the tendo achillis is sometimes ruptured by the action of muscle, and a fracture of the patella from the same cause is by no means an unfrequent accident. But in the dead subject, the tendons are stronger than the fleshy parts of muscles: appending weights to them when taken out of the body will demonstrate this—the muscle will invariably break first. Professor PEEL mentions an instance of fracture of both the pastern and coffin bones, from leaping: but we apprehend, that this accident was occasioned by the sudden imposition of the weight upon these parts, and not by any muscular force.

The power of a muscle is not in exact ratio to its size, but depends on its texture, or organization, and the degree of excitation it receives from the brain: thus it is

* By strange perversion of language, this bone is called, because it is said to correspond, in situation, to one of the same name in the human subject, os *pisiforme*.

that thorough-bred horses, in which both these circumstances seem to combine, are often stronger than cart horses whose limbs are very considerably larger.

The astonishing rapidity with which the contractions and relaxations of the muscles can be effected, is well exemplified in the motions of the limbs of the fleetest race-horses; in which HALLER conceived, that the elevation of the leg was performed at speed in $\frac{1}{70}$ of a second.

The extent of motion that a muscle is capable of producing, bears some proportion to its length; though there are many exceptions to this: hence many of those of the fore and hind extremities, and neck, when they contract, cause the parts moved—the feet and head—to describe the segment of a large circle. Muscles of great length however are always weak, when compared to others—short and thick, and whose points of attachment are near together: but these last possess, generally speaking, but a very limited action. HALLER, in investigating the all-wise designs of Nature, in the construction and arrangement of these organs, observes, that "all the contrivances of human skill end in this, that the moving power passes through a large space, while the resistance describes a small one. In the human body, on the contrary, the effect to be produced is, that the resistance should describe a large, and the power a small arc of a circle."

It would be productive of no advantage, and taking up time to little purpose, to make mention of the speculations of physiologists about the cause of muscular motion; for after all that has been said and written on the subject, writers of the present day confess, that we are still ignorant of the grand secret on what it depends: by way of briefly summing up, however, the results of their

investigations, we shall conclude with a paragraph extracted from Dr. Rees' Cyclopedia. "Our knowledge concerning muscular motions (says the writer of a scientific article on this subject under the head of muscle) amounts to this, that certain physical changes are produced in the fibres under the action of certain causes: these changes we call contraction and relaxation. When we say that a muscle acts by virtue of its irritability, contractile power, or contractility, we merely denote this fact, and express the phenomena in a general word: we know no more of this irritability, what it is, or how it is brought into exercise than we do of attraction, or the force by which the phenomena of dead matter are regulated."

In our last lecture we observed, that muscles in a natural state were not possessed of great sensibility, a fact that admits of ready proof by experiment; though, that there may be a feeling created in the voluntary muscles approaching to pain, in consequence of over exertion, which we call fatigue, every one is sufficiently aware of: under disease, however, the muscles often become the seat of acutely painful sensations, as we shall hereafter have occasion to notice.

All muscles act either in obedience to the will, or from the application of natural, mechanical, or chemical stimuli. The voluntary muscles perform their functions under the influence of volition; by them an animal is enabled to exhibit all the phenomena of voluntary motion, of which locomotion, the will of producing sound, or the voice, and the prescribed power over the organs of respiration, constitute the varieties. But these organs may also be excited to contract after their communication with the brain is cut off, by application of certain

substances of an extraneous nature, denominated *stimuli:* the mere contact of any foreign body will generally cause contractions in a muscle though its nerves be divided, or even after it be removed from the body. This property, apparently inherent in the muscular tissue, and not dependant on nervous influence, (in which respect it essentially differs from common sensibility,) is known by the names of *irritability, tone,* and *contractility:* it is one not only resident in voluntary, but possessed by involuntary muscles; for these last may be thrown into action by ordinary stimuli, though their communication with the brain be cut off, more forcibly, and for a greater length of time after all signs of vitality have disappeared, than the former. The heart has been found to retain this incomprehensible property of self-action the longest after death. This organ, though taken out of the animal, and laid upon the table, will continue to pulsate, and may be made to exhibit signs of life, by pricking or wounding it, or the use of chemical stimuli, or electricity, longer than any other, and after all attempts to excite action in the voluntary muscles have proved fruitless: hence it has been emphatically designated the *ultimum moriens.*

The involuntary muscles, during life, are set in action by what are called *natural stimuli*—such as are peculiar to each individual set of organs: the heart and arteries, for instance, are stimulated by blood, the stomach by food, and the bladder by urine. Other fluids than blood, thrown into the blood-vessels, disturb the heart's motions; some—as atmospheric air, suspend them altogether; and if blood be introduced into the bladder, it induces convulsions of that viscus. In fact, these several organs may experience derangement of function, either from the condition of their excitable part (which is commonly a fine

membrane) being altered, or from some variation in the properties of the substances applied to them. If the blood, for example, be inflamed, or otherwise changed in its nature, it may derange the functions of the heart; or urine of an altered composition may disturb the natural action of the bladder. On this principle it is, that aloes, which is a chemical, if not a mechanical stimulus to the intestines, produces purging; and that white hellebore excites efforts to vomit, though it has little or no effect after it has passed out of the stomach, being no more efficacious as a cathartic, than aloes is as an emetic; and both probably might be introduced into the bladder without exerting any specific action on it. The degree of irritability of these parts, or their aptitude for impression by certain stimuli, will vary from numerous and different causes; among which we may mention, the nature of the tissue itself, the species of animal, its age, sex, and temperament. We all know that a thorough-bred horse is more irritable than another; and some peculiarity in the texture of his different organs is, probably, the most rational way of accounting for it: his pulse, we have understood, is generally quicker than that of one of inferior blood. Why will one horse purge from three drams of aloes, and another require an ounce to produce the same effect? These, and a host of other phenomena, we can only explain by saying, that the irritability of organs and textures not only varies in its degree in different individuals, but in the several parts of the same animal at different times.

With regard to the influence of the brain and nerves on the muscles, we have already stated, that the functions of the voluntary muscles are regulated by the will; but what the nature of the excitation is that they receive from the

brain by the will, or by certain stimuli, we know no more than we do about muscular motion itself. The same chain of connexion conveys a something to the involuntary muscles, equally unknown. Of what, in fact, happens between the stimulus and the part stimulated, we are quite ignorant—we can go no further than view, with attention and admiration, the phenomena resulting from their reciprocal action, and with a knowledge of them we must rest content.

That the same medium of communication conveys a something to the involuntary muscles, though equally undiscoverable, not less essential to their natural action, will appear from very many facts collected from experiment. If the nerves going to the stomach are cut through, digestion becomes imperfect. Paralysis of the lower extremities is occasionally accompanied with retention of the urine and fæces. Division of the nerves called the par vagum, proves fatal, by destroying the functions of respiration and circulation. And if you remove the brain of an animal altogether, though the heart continues to contract for a certain length of time afterwards, its action may be suddenly arrested by dropping a little laudanum upon it; and then all subsequent attempts to re-excite it have no effect: opium being known to have the power of annihilating the nervous energy.

On the Diseases of Muscles.

The most common morbid affection of these parts is *spasm* or *cramp;* one which may be said to consist in a continued contraction of a muscle, or of some of its fibres. Assuming that what we have advanced be correct, as to the manner in which muscles are acted on in a natural state, it will not be difficult for us to comprehend the na-

ture of this affection. If the spasm be in a voluntary muscle, its contractions, before obedient to the will, are excited either in opposition to it, or without its concurrence; if in an involuntary one, either the stimuli are in excess, or the irritability of the muscle increased, so that it is preternaturally affected by the ordinary stimuli: in both cases the spasm is succeeded by relaxation, and does not recur until induced by fresh excitement. A dreadful instance of spasm occurs in tetanus, in which often all the voluntary muscles are more or less affected; it may, however, be confined to a few, or even to one muscle, of which we recollect to have seen two or three instances at the veterinary college. These horses were lame from a rigidity, the effect of spasm, of the adductores muscles upon the inside of the thigh. That spasm is attended with severe pain, we may infer from the symptoms attendant on cholic or gripes—a disease that consists in spasmodic contractions of the muscular coat of the small intestines: the common attacks, however, that almost every one has had of cramp in some part or other of his body, has probably informed him of the kind, as well as degree of pain felt by the animal on such occasions.

We have already made mention of the manner in which spasm is induced in explaining its nature. The most common cause of excessive irritability is inflammation, either in the organ itself, or in the general system, in which condition of parts common stimuli occasion undue and irregular contractions; hence tetanus seems to be generally induced under an inflammatory *diathesis*, and cholic is a common attendant of inflammation of the bowels. We may also adduce in illustration of extraordinary excitation producing spasm: the gripes may

be often traced to some offending matters taken in, and perhaps nothing more frequently occasions it, than cold water drunk at a time when the bowel is in an irritable state.

The remedies usually had recourse to for this malady, called *antispasmodics*, may be classed under two heads: those which act by diminishing the irritability of the part; and those that relieve by producing such an impression as renders it insusceptible of further stimulation, while their effects remain. Opium and other narcotics rank among the first: stimulants, aromatics, and certain other substances compose the latter;—among which the essential oils of turpentine, juniper, carraway, aniseed, and thyme—alcohol, ammonia, and æther—assafœtida, and camphor—ginger, and numerous others of the same kind, are those commonly made use of. A class of remedies, however, that may be considered as a third—one whose operation is more certain and effectual, generally speaking, inasmuch as it tends to afford permanent benefit, is that which removes the cause of irritation. As this is inflammatory action in the greater number of cases, we are at no loss to account for the good effects of venesection: or if it be in gripes, for the salutary operation of purgatives, which remove the offending substances from the alimentary canal. But we shall postpone what we have further to say on this subject, until spasm of the intestines comes under our immediate consideration.

On Stringhalt.

We reluctantly enter on this subject, since it must be confessed, we have had but few opportunities of observing its progress, or of examining into its causes with the satisfaction we could wish. We need give no descrip-

tion of the action, or peculiar gait of a horse said to have stringhalt: the greatest novice easily detects it, and seldom fails to make objections to purchase an animal thus affected. Mr. FERON *, one of the few writers who has noticed stringhalt, says, "I am convinced, however, by long experience and observation, that stringhalt, as it is called, is no disease, therefore can require no remedy." And in another place, "Indeed in Spain, France, and Germany, *it is esteemed extremely graceful in their riding schools,* or *manége, particularly when there is a stringhalt in both hind legs.*" This writer has, however, admitted it to be a disease, to the full scope of the word, in the very outset of his description by defining it to be "an involuntary convulsive motion of the muscles, which extend or bend the hock." In some particulars, stringhalt bears some affinity to what in human medicine is called *chorea;* we do not mean, however, to assert that they are essentially the same disease, much less do we imagine that a similar mode of treatment would have any good effect: all we wish to infer by such an analogy is, that they are both spasmodic or convulsive diseases, in which the will has lost more or less of its control over certain voluntary muscles. Not unfrequently, when the animal has lifted his hind leg from the ground, which is always done with a convulsive twitch, the fetlock nearly approaches the belly, and, by some other remarkable irregularities in its action, before the foot can be replaced upon the ground, (which it seldom is in the most advantageous position,) displays such unnatural movements as to convince us that volition has but little power over it during its suspension. Some-

* *A Complete Treatise on Farriery, &c.* by I. FERON, Veterinary Surgeon, 12th Light Dragoons.

times this irregular action is confined to one leg, but we believe that it is more commonly seen in both. It is seldom or never removed.

Such writers as offer any opinion of its nature, suppose it to be a muscular affection, mistaking, we conceive, the effect for the cause. We choose rather to refer its seat to the spinal marrow, or to the nervous trunks passing between it and the affected muscles; an opinion we were first led to adopt, from having observed a broken-backed horse exhibit all the characteristic signs of stringhalt, which, in this case, was clearly only an accompanying symptom of the former disease. It was stated in the foregoing part of this lecture, that section, or compression of the spinal marrow, paralyzed muscles, and that irritation of it convulsed them: now, we know that many cases of broken-back terminate in palsy; and, if this be true, why should not others be productive of stringhalt—since the one arises from compression, while the other is merely the result of irritation? It is not, however, necessary that a broken-back be present, for any other cause of irritation, we apprehend, would induce this disease. Horses are very subject to injuries of the loins—much more so than we seem to be aware of—from being suddenly stopped or turned, or from being overweighted about those parts; accidents that are but too seldom detected, since they may not be severe enough to constitute broken-back, though they may so far disturb the nervous functions as to cause stringhalt. Should the injury, or the consequences of it, be confined to one side, then only one column of the marrow will be affected, and but one leg convulsed: the nature and extent of disease in it, will perhaps determine the degree of stringhalt.

Such is our theory of a disease whose nature, we be-

lieve, has up to this time remained unexplained: whether we have taken a correct view of it, experiment and special attention to these cases in future, can alone decide. We have long had it in contemplation to attempt to induce stringhalt by artificial means; and we intend, as soon as an opportunity presents itself, to institute some experiments for this purpose.

We so seldom know any thing of the origin and progress of these cases, and, even if we did, they have generally endured so long, that it would be labor lost to treat them. Should however a recent case present itself, in a horse of value enough to render his recovery an object of consideration, we may pursue such means as have been recommended in the equally hopeless one of broken-back.

On Palsy.

Paralysis, or palsy, consists in a loss or diminution of the power of motion of some parts of the body, either with or without impairment or deprivation of sensation. In the human subject, it seldom happens that both these faculties are affected alike: palsied parts are seldom void of common feeling; though instances have occurred, but we believe they are very rare, of the total absence of sensation, in which the power of motion has remained. In horses, the hind extremities are most subject to paralysis, in consequence of the greater frequency of disease of the spine about the back and loins—commonly the result of external violence, as from casting; and it is not an uncommon termination of broken-back. Should this affection have come on suddenly, and be the effect of accident, either of the nature afore-described, or a fall upon the head, we are to ascertain, if it be practicable, whether there be compression upon any medullary part,

from a driven-in portion of bone; in which case, its elevation or removal is indispensable: it may be owing to an extravasation of blood, however, and here we should also be warranted in trepanning, supposing that we could determine on the precise spot that received the blow, and the symptoms resisted all other remedies. Venesection, strong cathartics, and blisters kept open, or frequently repeated, are the only means in our power, (without the operation,) likely to relieve, or remove the symptoms: should the case be a protracted one, and manifest some favorable changes, we may occasionally confer much subsequent benefit by the insertion of setons.

LECTURE XV.

On Bones.

BONES are the hardest and most inflexible parts entering into the composition of an animal: like the framework of a building, they give strength and support to all the others, which, in contradistinction to them, have been called the *soft parts.*

In the full grown animal the bones are perfectly white; but in the fœtus they exhibit a bluish cast, from their blood-vessels being comparatively of large size, and the blood showing itself through their imperfectly ossified sides: the bones of the former may be said to possess much earth, and but little blood; those of the latter, a large quantity of blood, and but little earthy matter. In very old animals they turn yellow, and have a peculiarly greasy feel; a circumstance owing to the transudation of the marrow contained within them.

If we make a section of a bone, we shall find it to be of much less solidity and compactness of structure internally; and to put on, as we approach its centre, a spongy and fibrous texture, easily broken down by the introduction of a common scalpel: this substance in the long bones of the extremities has received the name of

cancelli; in those of a flatter and thinner make, of *diploe.* Why bones should not have been formed solid throughout, we can assign sufficient reasons. In the first place, being hollow, they are considerably lighter, and therefore require less power to move them; and in the next, they are stronger—as may be proved at any time by making the following experiment. Take two glass cylinders of equal length and diameter, the one solid, and the other hollow, and place their extremities upon pedestals, of any description, and, in this situation, append weights to their centres: the solid one will break from a less weight than the tubular. Bones by being hollow, also present a more extended surface for the attachment of muscle, and afford a convenient repository for the marrow.

Bones by calcination, or by long boiling*, undergo some changes in their composition: they lose much of their original compactness of texture, exhibit a porous or cellular appearance, and become lighter, whiter, and extremely brittle. If we examine them, in this condition, a little more closely, we shall perceive that they are fibrous throughout, and that their walls only differ from the interior parts in the greater compactness of these fibres; for though the shell of a (more especially calcined) bone appear to be composed of several *lamellæ,* or plates, yet do these, in fact, consist of fibres so disposed as to form separate layers. The shell of the bone, then, its most compact and hardest part, is made up of several lamellæ, which, after burning or long boiling, may be chipped off in the form of thin scales; and these plates are rivetted together by numerous little bony fibres, running in a

* More expecially in PAPIN's *digester,* in which the water is heated beyond the boiling point.

transverse direction; which, from this circumstance, have been named the *claviculi*, or nails. According to this disposition of the fibres, it is evident, that something like a network composes even the hardest parts of a bone; and, if we might be allowed to compare this with the reticulated structure within it, we should say, that the shell itself was nothing more than a more compacted cancelli. What would appear to amount to a developement of this structure, is a minute inspection of the cancelli of a long bone: these, in the middle, where the shell is thick and strong, are few and spacious, but abundant and close at the extremities, where the walls are extremely thin; as if the shell at either end had parted with its internal lamellæ to form the cancellated structure within.

We shall find it to be pretty universally the case, that where a bone grows large and protuberates, its shell becomes proportionately extenuated, being chiefly expended in forming medullary or cancellated structure; on this account, the largest is the weakest part of the bone, though, in truth, it contains as much substance as where the wall is of twice, or thrice the thickness. This remark not only applies to different parts of the same bone, but with singular force to the bones of different animals of the same species: take, for example, sections of equal length of the metacarpal bones of the cart-horse and the thorough-bred; and the latter, although much exceeded in diameter by the former, will weigh just as much, and be not only more compact and firmer in appearance, but absolutely stronger. This will serve to shew cause for the prodigious strength possessed by slight spindle-shanked blood-horses, and their superiority over others, in this respect, which are much larger, and much coarser in their texture; and not only weaker, but

softer in their nature: and this is probably one of the happiest illustrations of a remark that we might extend through a long range in the animal kingdom. In the very young animal, the bones are solid throughout—not exhibiting any cancellated appearance; and even in the old, there are many flat bones which become so thin as to have lost all traces of diploe. Within the cells of the cancelli are found numerous little membranous bags, full of an oily fluid, called *marrow*, of the nature and uses of which we shall have occasion to speak in the concluding part of this lecture.

In addition to the hard—the earthy part, of which we have been speaking, bones consist of an animal substance of the nature of cartilage; to demonstrate which, we have nothing more to do than to steep them, for a time, in some weak acid: by degrees they will lose their hardness and brittleness of texture, and be converted into a soft flexible substance, retaining the form of the original bone; and this, by further maceration, or by boiling, may be resolved into jelly, or glue. While a bone owes its color, brittleness, and strength to the earthy matter it contains, it is in this, its cartilaginous part, that its vessels ramify—that its living principle, in fact, may be said to reside: the earth is nothing more than a deposition from the mouths of arteries, disposed in a way we have already described; the interstices of which are filled up, in the recent bone, by this, its animal part. In the human subject, there is a disease surgeons call *mollities ossium*, in which the bones become so soft and flexible, in consequence of a deficiency of earthy matter, as actually to bend under the superincumbent weight, and give rise to considerable distortion: when this disease—or something probably of the same nature—occurs in children, they are denominated *ricketty*,

the deformities of which are too well known to require description here. We have seen mis-shapen foals with considerable distortions of the legs, chest, and hips; in which, as the deformity happened after being dropped, it probably arose from deficiency of earthy matter in the bones, or some irregularity in the ossific process: in this animal, however, nature generally removes such defects during growth, a fact the experienced breeder well knows how to estimate, in keeping his *crooked foals* with a view of their *growing straight.*

Bone, though it appear to be inorganic to the more superficial observer, admits of its vascularity being demonstrated with nearly the same facility as any other part of the body. That it possesses numerous arteries, is proved by injection; for if, in the young animal, we throw melted size colored with vermilion into the principal artery of a bone, minute vessels may be distinctly seen ramifying throughout its substance. But in the course of our dissections, we are often enabled to trace vessels of considerable size into the substance of the larger bones, through foramina in their walls: one of them, larger than the rest, commonly enters about the centre of the long bones of the extremities, to which the name of *medullary artery* is given, from its sole distribution to the medullary structure. Were these demonstrative proofs wanting, however we have others from which we might infer, with equal certitude, the existence of blood-vessels in these organs. If a bone in the living animal is sawn through, blood is seen oozing from its divided ends, or should the parts have been previously injected, the appearance of injection upon the sawn surfaces, affords abundant evidence of its vascularity. An experiment physiologists have been in the habit of considering as conclusive on this subject,

is that of feeding a pig, or other animal, with madder—a substance which will retain its color during the processes of digestion and assimilation: in a short time the bones of the animal, previously white, become red, in consequence of being tinged with the madder; which effect, say they, could not have happened in other than organized structure*. It appears that bones are not sensible in their natural state, though they are unquestionably so when inflamed: in the operation of amputation, in the human subject, for instance, the patient does not complain of any pain while the surgeon is sawing through the bone; and as to the vulgar idea, that all the feeling resides in the marrow, it is hardly necessary to observe, that it is without foundation: the membrane composing the cells may possess sensibility, but the fat, or marrow, being a secretion, cannot feel any more than the saw itself. In the bones of some animals absorbents may be injected in considerable numbers, in consequence of their not having valves—as in fish; but, though they are probably equally numerous, in those of quadrupeds we cannot demonstrate them; we only infer their presence from many phenomena which we notice relative to these parts, both in health and disease. If such were not the case, we could not account for their being tinged with madder, nor explain the process of sloughing in bones, termed *exfoliation*—in which the dead portions are separated from the living, and cast off in the form of scales.

On the Diseases of Bones.

THOUGH the horse be not obnoxious to those specific diseases of the human subject so often attended with mor-

* Of late another explanation has been offered.

bid affections of these parts, he is an animal of all others the most liable to have ossific disease excited in his frame from external injuries of various kinds, and from excessive exertion. Bones are subject to nearly the same diseases as the soft parts of the body: inflammation in them may terminate either in the effusion of adhesive matter, in suppuration, or in mortification. If a bone be fractured, it will be again united by a sort of adhesive or albuminous substance, called *callus,* poured forth from the arteries of the opposed broken extremities; which, in a short space of time, will be converted into bony matter, and effect a re-union as strong as any part of the original bone. This kind of inflammation however, which commonly affects the external or periosteal surface of the bone, is one that may be, and most frequently is, induced by injury to ligamentous structure; from which it extends to the bone itself. Abscesses sometimes form within the shell of a bone, but more commonly in its interior: in these cases, additional osseous matter is deposited upon the exterior of the bone, in order to enable it, during the ulcerative stage, to sustain the superincumbent weight, (which it otherwise could not do, in consequence of being weakened by internal absorption,) through some part of which a small opening is made, by ulceration, in order to discharge the collected pus. Something similar to this takes place in the process of exfoliation, sometimes called *necrosis.* When a piece of bone has lost its vitality—best known by its turning black—absorption is immediately set up for its removal, during which time new bone is deposited around it, lest the old might give way from the pressure of the parts above; and in this, after a time, holes are made by ulceration for the discharge of the dead bone, by small and separate pieces: so that, in fact, a bone dur-

ing exfoliation, is little or not at all diminished in strength, and knowing this, we are not apprehensive of fracture, though the animal make use of the limb during the process.

In the same way then in which a slough, or core, is first detached from the surrounding vital soft parts, and afterwards cast off by the subjacent granulations, so dead bone is separated from the living; a process surgeons have of late years, from a vigilance to the operations of Nature, thrown much light upon: it is, as might be expected, however, one of slow advance, and one that requires a long time for its completion.

On Exostosis.

An osseous tumor originating from a bone, is called an *exostosis:* such is a splint, a spavin, a ring-bone, &c. Though these are the more familiar instances of the disease, there is, perhaps, no bone in the body that has not been seen, one time or other, thus affected: we have now specimens before us of exostoses of the spine, ribs, pelvis, bones of the haunch, thigh, shoulder, arm, leg, and a considerable number of the pastern, coffin, and navicular bones; a few of the lower jaw; and one, as large as a hen's egg, projecting from the orbitar portion of the frontal bone, and so placed in front of the orbit, as to render almost useless the eye on that side. Perhaps no animal is more the subject of this disease than the horse; and as it very often proves a source of permanent lameness, we should, by making ourselves well acquainted with its nature, endeavour to arrive at a knowledge of the best means of treating it.

Sir A. Cooper, from whose excellent practical essay

on this subject* we have derived much valuable information, divides exostosis, in reference to its seat, into two kinds, *periosteal* and *medullary;* and, again, as to its nature, into *cartilaginous* and *fungous:* but it is to that kind only which is situated between the shell of the bone and the periosteum covering it, that we have to attend in veterinary practice. From the very accurate observations of the distinguished surgeon just mentioned, who calls a tumor of this nature, *cartilaginous exostosis of the periosteum,* "it originates in an inflammation of the periosteum, and of the corresponding part of the bone; and a deposition of cartilage, of a very firm texture, and similar to that which forms the nidus of bone in the young subject, adheres to both these surfaces. The periosteum adheres to the external surface of the swelling, and the swelling itself is attached still more strongly to the surface of the bone; it continues afterwards to be secreted as the cartilage increases in bulk; for it appears that between the periosteum and bony mass, cartilage is constantly secreted, which constitutes the exterior surface of the tumor. Thus, on dissection, we discover, 1*st.* The periosteum thicker than natural; 2*nd.* The cartilage immediately below the periosteum; and, 3*rd.* Ossific matter deposited within the cartilage, extending from the shell of the bone nearly to the internal surface of the periosteum, still leaving on the surface of the swelling a thin portion of cartilage unossified."

"When the accretion of these swellings ceases, and the disease has been of long standing, they are found to consist, on their exterior surface, of a shell of osseous matter,

* *Surgical Essays,* by Messrs. Cooper and Travers. Part I.

similar to that of the original bone, of the same cancellated structure, and communicating with the original cancelli of the bone. Consequently when an exostosis has been formed in the manner here described, the shell of the original bone becomes absorbed, and cancelli are deposited in its place. In the mean time, the outer surface of the exostosis acquires a shell resembling that of the bone itself. When the exostosis has been steeped in an acid, and by this means deprived of its phosphate of lime, the cartilaginous structure remains of the same form and magnitude as the diseased deposit; and as far as I have been able to discover, it is effused precisely in the same manner as healthy bone. From which it appears, that the formation of these excrescences differs in no respect from that of the original bone, since they are composed of cartilage for their basis, and of an earthy salt to impart to them firmness and solidity; a circumstance which I have shewn for many years in my lectures." To the truth of this last remark we can bear witness, as also, as far as our own observations have gone, to the applicability of the whole of this valuable exposition of the nature of exostosis, to those cases which come under the immediate notice of the veterinary practitioner.

An exostosis, abstractedly considered, does not appear to occasion much inconvenience to the animal; so generally, however, are other parts in the vicinity involved in disease, that the ossific deposit becomes diffused, and renders fixed parts naturally moveable on each other: thus, so long as a ring-bone is confined to either of the pastern bones, it is of little consideration; but should it shew itself near one of the joints, it seldom fails to produce lameness, which is often of a permanent nature. Lameness therefore is by no means an invariable

symptom of exostosis; for most splints, many ring-bones, and even spavins, exist without occasioning any apparent alteration in the action of the limb; and we now and then see an exostosis of prodigious size unattended with the least perceptible inconvenience to the animal. When this disease invades ligamentous structure, however, lameness generally accompanies it—as spavins, and recent splints fully evince; an effect we would refer simply to the excessive tenderness of that part when inflamed, rather than ascribe it to the extension of the periosteum from the bone underneath: a notion borrowed from human surgery, and somewhat too hastily received by veterinary surgeons. We know that neither spavins nor splints produce lameness severe according to their size, nor correspondent with their rapidity of growth; and that many splints, ring-bones, and other nameless tumors of the same nature, though of great size and quick growth, are wholly unattended with lameness. Should the tumor interfere, either from its bulk, or situation, with the motions of joints, muscles, or tendons, lameness is a concomitant, and often irremediable symptom: we have very lately seen a horse, in which an exostosis as large as a child's head projected from the point of the shoulder, occasioning so much impediment to the motions of the shoulder-joint, as to produce considerable lameness, which nothing but the removal of the tumor, by operation, could relieve.

In the human subject, the origin of exostosis, unless it be traceable to some external injury, can seldom be made out; but in the horse, its production, almost always, may be very satisfactorily accounted for. The most frequent causes of that exostosis which unites and fixes bones together, before attached by some elastic substance—such

as spavins and splints, are undue acts of exertion, and the imposition of weight disproportioned to the strength of the animal: hence it is that young horses are particularly liable to throw out splints and spavins, when severely worked, or overburdened. Any sudden, or extraordinary efforts in action, may give rise to this disease: among the most common are the improper exercises young and unbroke horses are put to in riding-schools—throwing them too much on their haunches, violently backing them, or too suddenly pulling them up at full speed; hunting, and racing also at a tender age, while the joints are yet in a state of imperfection, very frequently cripple horses for life, by laying the foundation of exostosis. These parts are sprained, inflammation is excited in the ligamentous substance entering into their construction, and this extends itself to the bones and periosteum: in the sequel, the ligament is converted into bone, the bones, before moveable upon each other, are rendered fixtures, and the periosteum is raised by cartilaginous and bony accretion, which commonly presents itself in the situation of a splint, a spavin, or a ring-bone; though there are some peculiarities attending each of these exostoses, which we shall point out in future lectures. So very prone, however, is the horse to this disease, that even a blow upon a bone will be frequently followed by an exostosis. In the human subject, certain peculiarities of constitution would appear to favor the production of these swellings: a remarkable case of this kind is related by Mr. Abernethy, in which the most trifling injury to any bone in the body, was followed by exostosis.

In the human subject, various constitutional remedies have been tried for the prevention, as well as dispersion, of exostosis; and among others, such as are known to

act chemically on the osseous matter itself, which is phosphate of lime: they have all, however, we believe, failed in affording benefit. In the horse, we must content ourselves with the use of local means; and these we shall find to be sufficiently abundant and diversified, if we take into our account the various nostrums of the old practitioners. As we do not intend, however, in this place, to notice any but what are applicable to all cases of this nature, we must pass over, for the present, these recipes for modifications of it without remark. Stimulants of various kinds, in the form of ointments, liniments, and lotions, have been recommended from the oldest records of farriery; with the exception however of some few, among which the *essential oils of thyme*, and *aniseed*, and the *liquor ammoniæ* are the chief, they have all been exploded, and even these superseded by the justly celebrated remedy of blistering: we know of nothing that tends so much to produce absorption, and diminish lameness, in so short a time, and with so little inconvenience to the animal, as a common blister. We are not to content ourselves with merely trimming off the hair from the skin and applying a blister in the ordinary way, but we are either to keep up constant irritation and discharge upon the surface of the swelling by dressing it with a milder ointment of cantharides, or to re-excite inflammation in it from time to time by a repetition of blisters. Could we in the first instance draw blood from the part, prior to blistering it, it would doubtlessly have a good effect; we can but seldom however take advantage of this, and therefore we should have recourse to such remedies as rank next in point of efficacy. Various means have been employed to reduce exostosis by pressure alone: but none (and they are all

difficult of application) can be compared with the actual cautery; which acts not only with more effect than any bandage, or other contrivance we may make use of, but is, at the same time, an irritant to the surface. Generally speaking, we should precede its use on all occasions by blisters.

Caustics of the most active kind, have been used and recommended for the removal of exostosis: they are seldom admissible, however, from the vicinity of a joint, and have but too often aggravated that which they were intended to relieve.

At the Veterinary College it is the practice to divide the periosteum in splints, with the same view that surgeons sometimes make an incision through it in nodes: and an intelligent friend of ours, a surgeon, for whose opinions, even on veterinary subjects, we have much regard, proposes to strip it off in these cases. But a splint differs as widely from a node in its nature, as the causes do that give rise to them; and we believe, as we have just stated, that, although it may partake of the inflammation, and probably undergoes some extension, the periosteum is *not* the seat of pain and consequent lameness. Else, how comes it, that so few splints are accompanied by lameness?—that spavins seldom exist without occasioning more or less lameness?—and that ring-bones only produce it in certain situations? If a stretched periosteum be the cause of lameness, its division, or the removal of a portion of it, ought to give immediate relief; and the means are as applicable to spavins and ring-bones, in certain situations, as they are to splints, or to any other kind of exostosis: but as we shall have occasion to agitate this question again, we need not anticipate here.

Issues, in the form of setons, have been of late substituted for blisters in some of these cases. To their employment there appear to be three objections: the first, and most potent, is, that their operation is so exceedingly tardy, even in those instances in which they seem to do good, that they will not effect in a month, what a blister kept open, or repeated, will do in a week; the second is, that they leave a blemish upon the skin, which requires some time to be effaced; and the third, that, like all other remedies, they must fail as restoratives where ligamentous parts have already become bony; on which account, we can expect but little from them in chronic cases of this description.

The removal of exostosis by an operation, has been performed, we are told, more especially in splints and spavins, with success; and no doubt there are cases in which such a mode of practice would be of advantage; it is, however, for reasons we shall hereafter mention, not often applicable to spavined horses. Such an operation requires much skill in the performance, and instruments of a different description from what the forge can possibly furnish: it is one that appears to have failed, where we have seen it tried, both from inattention to this circumstance, and from a mal-selection of cases. Of late it has succeeded beyond expectation in the human subject, and it promises to be, as a surgical remedy, at some future day, of very considerable importance; and there cannot be a doubt of its utility in veterinary practice, were subjects properly chosen, and more particularly in those cases where the tumor inconveniences from its magnitude, or where our object is to get rid of an eye-sore: but it behoves us to provide ourselves with fit instruments for the purpose, and to be well acquainted with the anatomy of

the parts, before we can hope for success from the performance of such an operation*.

On Marrow.

MARROW is a soft substance of an oleaginous nature, deposited in the cavities of bones. It varies in its color and consistence according to the food consumed by the animal from which it is taken; being white and solid in such as are graminivorous, but yellowish and more like oil in carnivorous animals. Knowing the internal structure of a bone, we shall have no difficulty in understanding how the marrow, which is contained in an infinite number of little spherical bags, is lodged, or rather suspended within the cancelli; for these sacs, which are composed of a delicate vascular membrane, bear much resemblance to the cells of the adipose membrane, being, like them, perfectly circumscribed, and distinct from each other. If they were similar in their construction to those of the reticular membrane, communicating one with another, we should find the marrow, from gravitation, now and then

* Sir A. COOPER, in his *Essay on Exostosis*, has detailed several cases, in some of which complete relief, in others considerable benefit, have been derived from this operation: one that tends to be of eminent service in human surgery. Sir ASTLEY concludes his account, (which we strongly recommend the perusal of to those who seek further information,) by the following practical remark: "It appears then, that bones, after operations, unite by adhesion to the soft parts; if adhesion cannot be produced, healthy granulations arise from the surface of the bone, and cicatrization takes place upon these, as upon the other parts of the body; *and that there is reason to believe, that these structures may, with properly constructed instruments, become much more the subjects of operations, than they have hitherto been considered.*"

all collected at one extremity of the bone: an appearance that no one has ever met with.

These medullary cells are furnished with minute arteries, spread out upon their interior, by the mouths of which, it is supposed, the marrow is deposited, in the same way, and at the same time, that other parts of the body receive their fat. Marrow, we said before, being a secretion, is wholly inorganic in itself; the common notion, therefore, of its being acutely sensible falls to the ground as absurd: though the medullary membrane may possibly feel under certain morbid conditions.

Long ago it was believed by some, that the use of marrow was to render the bones less brittle, by oozing through their pores; we now know, however, that it is not simply inclosed within the bone, and that, being contained in a membrane, nothing like transudation can ever happen during life. It is probably serving a similar purpose to that which the fat does: *viz.* that of supplying the demands of the system, when the animal, either from disease or accident, is deprived of a sufficiency of nutriment; in corroboration of which opinion, it has been remarked, that lean animals have little or no marrow, but that in fat ones, on the contrary, the bones are filled with it.

LECTURE XIV.

On Glands.

A GLAND may be defined to be, a secreting organ; by which we mean, one that separates a fluid from the blood differing in its properties from the blood itself. In this definition, we have given to the term its most comprehensive meaning; for, by most writers, and indeed in common language, it is used to designate an organ, not only furnished with secretory vessels, but with others, called excretory ducts, whose use is to collect and convey the secretion from it. Were we to view it in this light however, we must necessarily exclude from our notice many structures which in their functions are purely secretory; inasmuch as they do separate certain fluids from the blood, though they present to us a much less complicated apparatus for the purpose. On the other hand, many organs in the body have received the name of glands, though, as far as our knowledge of their economy extends, they perform no such use: the absorbent glands are of this class, as are also the spleen, the thymus gland, and the pineal gland.

The classification of glands which we shall here adopt, at the same time that it appears to be the most natural

and simple, is so comprehensive that it will include every organ to which the term, *gland,* can be applied, according to our present view of its nature: it is one grounded purely upon structure, and one that will much aid us in unravelling the complex parts of the more perfect glands, by first making us acquainted with the most simple pieces of secretory mechanism.

There are three classes of glands in the body. The first, and most simple in its construction, is that of an *extended membrane;* upon which the arterial capillaries, or exhalents, terminate by open orifices, too minute to be detected even by our most powerful magnifying glasses: the peritoneum, the pleura, and the synovial membranes are of this kind. That this is the minute structure of an extended membrane, we infer from the apparent simplicity of its organization, as well as from the nature of the fluid secreted by it. In the chest and belly, we know that an aqueous exhalation is present during life, which has been found to bear much resemblance in its properties to the serum of the blood, strained through vessels of extreme exility, without any commixture of the grosser parts of that fluid; and that this is a secretion from the pleura and peritoneum, parts whose texture are alike, does not admit of a doubt in the mind of the experimentalist. The secretions of these glands, submitted to chemical examination, have been found to be either of an albuminous or serous nature; though it would appear that both are serving similar purposes: *viz.* those of lubrification, of preventing friction, and facilitating motion.

The second kind of gland is called a *follicle.* This differs in nothing more from the first than in being of a different form—the intimate organization of both is precisely similar: membrane of the same composition as

that lining the different cavities of the body, is thrown into a follicular shape, constituting a bag, follicle, or cul-de-sac; into which the secretion is poured by exhalent arteries, (as it is upon the surface of an extended membrane,) to be pressed out as occasion requires. There are several of these follicles, or *cryptæ,* as they are also called, within the nose, opening upon the surface of the pituitary membrane; and numerous others upon the skin, out of which you may squeeze an inspissated cheese-like secretion, not unfrequently, from its appearance, called a *worm:* in the urethra, and upon the glans penis, are some of large size; the white caseous substance at times collected in considerable quantity upon the latter, is a secretion from them. The mucous glands belonging to the lining membranes of the pharynx, esophagus, stomach, and intestines, and those of the glottis, and trachea, are also of this class.

The third sort, or true gland, is that in whose composition is an excretory duct; from which circumstance, it has received the denomination of a *ductiform gland.* This is one of a more complicated structure than either of the others, and one to which no particular description will apply in all instances, inasmuch as one ductiform gland differs from another in the disposition of its component parts. From one very obvious difference in the construction of these organs, they have been subdivided into *conglobate* and *conglomerate* glands: the liver and kidneys are of the first kind; the salivary and lachrymal glands, and the pancreas, belong to the latter. The conglomerate glands are easily resolvable into many distinct portions, called *lobuli,* which are connected together by loose cellular membrane; and these into others still smaller, said

to be made up of numerous little granulary bodies, named *acini*, respecting the intimate structure of which there has been much controversial writing. By MALPHIGI, eminent in the Italian school of medicine, they were believed to be hollow, with arteries distributed over their surface; from which the secreted fluid oozed into the cavity, to be thence conveyed by an excretory duct into the proper receptacle. RUYCH, the no less celebrated Dutch anatomist, on the other hand, contended that the acini were constituted of clusters of vessels, and that the excretory tube was continuous with the secreting artery. With regard to the ultimate distribution of the secretory vessels of the liver, kidney, and testicle, though they are all conglobate glands, for reasons before given, no single exposition can be correct: we shall, therefore, dismiss the subject for the present, reserving all minute detail until we have occasion to speak of particular glands.

All glands are furnished with veins to convey back to the heart the redundant blood; *i.e.* that blood superabundant for the support of the organ, or for the production of its secretion: these vessels are larger than their corresponding arteries, though not so disproportionately so as in most other parts of the body.

Some glands are supplied by a single artery, others have more than one sent to them: *e.g.* the testicle receives its blood from the spermatic artery alone; but the pancreas, from numerous small ones, called the pencreatic. Arteries, as soon as they have entered the substance of a gland, do not appear to possess the same degree of elasticity as before; for in inspecting the interior of the organ, we can scarcely distinguish them from the veins.

The nerves, compared to the size of these organs, are

small: they pierce the substance of the gland in company with its blood-vessels, around which they frequently form a sort of net-work previously to their entry.

Some glands have but one excretory duct; others, several: the liver, pancreas, kidneys, and testicle, instance the first; the udder of the mare, and the lachrymal gland, the last. Again, some of these organs are furnished with a reservoir, into which their excretory ducts pour the secreted fluid, and from which it is again taken up by other tubes of a similar nature: the best example of this is the kidneys—in them small vessels, named the *tubuli uriniferi,* distil the urine into a membranous funnel, called the *pelvis,* from which it is imbibed and conveyed by long excretory tubes—the *ureters,* into the bladder. An excretory duct is composed of two coats; and the outer of them is said to be of muscular structure: we are rather induced to believe so, however, from the function it performs, than from any direct evidence afforded by dissection; though it has been asserted, that the ureters exhibit a *fibrous* appearance, and that if they be irritated in an animal very recently dead, they may be seen to contract like the fasciculi of a muscle. The internal coat is of a glandular nature: its vessels produce a mucous, which serves to defend it from the acrimonious properties of the secretion; and this has given it the name of *mucous coat.*

There are some glands inclosed in proper membranous coverings, or *capsules;* and these envelopes, which are united to their exterior by reticular membrane, generally send off processes that pervade the substance of the gland in company with its blood-vessels; thereby serving as their connecting medium, as well as that of its ducts, nerves, and absorbents. Such a contexture is best demonstrated in the testicle and kidney.

Absorbents may, in general, be easily injected in all glandular structures; indeed in some, particularly in the liver and spleen, they exist in very considerable numbers. By the insertion of a pipe under the peritoneal covering of either of these glands, we may frequently succeed in filling numerous absorbent vessels upon the surface; which, from the arborescent appearance they exhibit, makes a ready and beautiful preparation.

On Secretion.

Perhaps no subject in physiology has more attracted the notice of the chemist, at the same time that it has occupied the attention of the physiologist, than the one before us: but the researches of these philosophers have only furnished materials for the framing of theories, which, however much they may elucidate the mysteries of secretion, still leave the principal phenomena relative to this vital process involved in obscurity. The simple question, divested of all speculative matter, is to point out how, or in what manner, fluids, such as saliva, bile, and urine, are separated, or secreted, by their respective glands from the general mass of blood—fluids, though of such various and even opposite properties, so uniformly elaborated in the same organs, that conversion or commixture of them is unheard of. The liver invariably produces bile; the kidney, urine; and the testicle, semen: no one has ever found urine in the hepatic duct, nor bile in the ureters. Moreover, the same gland in a healthy state always prepares the same fluid: though, under morbid action, the secretion occasionally is found to vary in quantity, and somewhat in quality, from that ordinarily produced.

Chemists have endeavoured to throw some light on the subject, by accurately analyzing blood drawn from the secreting vessels of different glands; but, hitherto, no one has been able to detect any difference in its properties, be it extracted from whatever part of the body it may: so that although the component parts of urine, bile, &c. exist in the blood, yet are we not able to discover either ready-formed in that fluid.

The best theory—for it is all supposition—is the following. Assuming that the elementary ingredients of all secretions are contained in the blood, it is said, that, by a mode of action peculiar to the blood-vessels of certain parts, they are so elaborated and combined, as to produce the very opposite compounds, called urine, bile, semen, saliva, &c. By way of illustrating this hypothesis, the process of secretion has been compared to the familiar operation of churning: this, we know, in order to make butter of a good quality, requires a regular and continual motion of the churn-stick, and hence it is, that those who are not in the habit of performing it, not unfrequently fail in the product. Something of the same kind seems to happen in the glandular functions. If, for example, mercury be given to a man, or to a horse, in sufficient doses, his salivary glands will not only secrete more saliva, but that saliva will be somewhat altered in its properties; an alteration we believe to be dependant on some disturbance in the action of the secreting organ, and not on any change in its mechanism: in this way, we offer something explanatory of the nature of diabetes—a disease in which the urine differs remarkably from that secreted in ordinary health. Some phenomena very analogous to these, are presented to us in the vegetable kingdom. If, for instance, you ingraft a branch of a peach-

tree upon one of a plum-tree, you will not alter the produce of the graft: notwithstanding the same kind of sap (which may be considered as the blood of a vegetable) circulates throughout the whole tree, and, consequently, through this graft, yet will it bear peaches. According to the theory before us, we must explain these curious facts by saying, that the fruit, like the secretion in a gland, is modified by the peculiar action of those vessels through which the sap passes. Little as this developes the mysteries of secretion and fructification, it serves as reciprocally illustrative of two perhaps of the most obscure vital processes of nature; and here the mind must rest satisfied in our present imperfect knowledge of intimate organization. All we know of the apparatus of secretion amounts to so little, that we are far from being able to assign the separation of any one fluid to any particular kind of glandular mechanism: and we have not hitherto had the subject placed in a clearer light by the science of chemistry. Whatever be the manner in which secretion is carried on, its importance in the animal economy may be considered as two-fold:—those substances which are separated from the blood, being produced to serve some purpose in the system; or to be ejected, through its excretory channels, as useless or injurious.

The action of a gland may be increased by various *stimuli*, which, in relation to their effects, have received the epithets of *common* and *specific*. Thus, direct mechanical, or chemical irritation of any kind, will affect all glands: *e. g.* if a horse happen to have a hay-seed under his eyelid, the immediate effect is a flow of tears from the lachrymal gland; and any irritating chemical preparation—such as nitric acid, will give rise to the same defluxion. But there are certain substances that only stimulate

particular parts; so that what proves an irritant to one, may be perfectly innocuous when applied to another: *e.g.* aloes acts powerfully on the mucous coat of the intestines; calomel, on the salivary glands and pancreas; and turpentine, on the kidneys.

We are far from knowing what influence the nervous system has upon the glandular functions: the operation and extent of such a power have been variously estimated by different physiologists. That secretion, in some parts, will go on independant of nervous influence, is seen in the feet of horses that have been subjected to neurotomy—in them the horn is furnished in equal abundance; and inflammation and suppuration of the laminæ have in too many instances resulted from subsequent injuries, though the parts, at the time, were totally devoid of sensibility. On the other hand, it has been ascertained by experiment, that the functions of the stomach are so much impaired by the division of its nerves, that digestion is not perfected without them; and, indeed, by no other agency than that of sympathy, can we explain the well-known effects which various motions of the mind have on certain glands. In the human subject, the phenomena of this description are many: as the most familiar, we may mention—the presence of tears excited by grief, the secretion of saliva at the sight of food, and the immoderate flow of urine occasioned by excessive fear. Even in horses, those who are acquainted with the habits of the animal must have remarked, that disquietude, or what might be considered as anxiety of mind, induced by any cause—as the separation of one from others with which he has been habitually stalled, will give rise to frequent staling. Perhaps the best example we have of it, how-

ever, is in the secretion of semen; which, in stallions, happens in considerable quantity during the venereal æstrum.

On the Diseases of Glands.

If a gland become inflamed, its secretion will be suspended: *e.g.* in inflammation of the kidneys, little or no urine is passed; and when the intestines are highly inflamed, costiveness is a diagnostic symptom. Whether the secretion be altogether suppressed, or not, however, will depend on the extent to which inflammation has pervaded the substance of the organ; for if it be but partial, there may be some parts actually secreting more than in a healthy condition. For simply increased vascular action tends to augment secretion; and thus, probably, it is, that the medicines which we call purgatives, diuretics, sialagogues, and some others, produce their effects.

The secretion of a gland is sometimes much altered in its properties, in consequence of more or less derangement of function: *e.g.* diabetic urine is supposed to originate from such a cause; and, now and then, calculous matter is separated by the kidneys. We have at present before us two fine specimens of urinary calculi, which were taken from the bladder—by no means a common occurrence in horses, when we glance at the frequent case of stone in the human subject.

Glands are subject to enlargement. Several times we have seen the spleen greatly increased in bulk: in one instance it weighed fourteen pounds, two ounces—about eleven pounds more than its weight in health.

The organization of a gland suffers a total change,

or rather destruction, sometimes, in consequence of long continued disease, or frequent relapse of it: the liver is occasionally met with much altered in its texture; and the kidneys undergo morbid changes, which we shall in a future lecture take particular notice of.

LECTURE XVI.

On Cartilage.

CARTILAGE is that tough, white, and highly elastic substance, better known by the name of *gristle*; of an intermediate firmness between bone and the softer parts of the body; and that by long digestion, in close vessels, may be converted into jelly or glue.

There are three kinds of cartilage in the body. First, that which supplies the place of bone during life, and serves to give form to parts composed of it—such are the larynx, the windpipe, the ears, the nostrils, and the cartilages of the ribs. Neither bone, nor membrane would have been suited to the various purposes that cartilage answers in these parts: had the ears, or nose, for example, been made of bone, how inflexible must they have been! —and how continually liable to fracture!—or, if membrane had been substituted for cartilage, a collapse of the external parts must have ensued, and consequent impairment, if not deprivation, of the senses of hearing and smelling. The second kind of cartilage is what is substituted for bone in the fœtus; but in the adult is absorbed, and bone deposited in its place. The third kind, called the *articular*, is that which covers the extre-

mitics of bones, and furnishes them with those polished surfaces which, when applied, constitute the chief parts of a joint: and for this purpose, from the smoothness and slipperiness of its surface, and its great elasticity, it is admirably adapted.

Cartilage when cut into, exhibits throughout such an uniformity of texture, that at first sight we should not suspect it to be, what it is considered by the best anatomists to be, of a fibrous composition. It is covered by a membrane, called the *perichondrium,* which differs in no respect from the *periosteum*—one that we shall hereafter have occasion to describe.

With regard to the organization of cartilage, that which is put for bone in the fœtus is extremely vascular: its blood-vessels can be shown by injection; and the phenomena of ossification satisfactorily prove the existence of absorbents in it. But of the other two kinds, and more especially of the articular, the vascularity has been often disputed: there can be little doubt, however, of its being possessed of life—and we have only ideas of life as connected with organization. Vessels, indeed, may be injected in the perichondrium, and many of these, most probably, ramify within the substance of the cartilage; though they are too minute to admit of red blood, or of our most subtile injection. Madder has been given to animals with a view of discovering if the articular cartilages were vascular; but no change of color was effected in them, as constantly happened in bones: nor do we believe, that they have ever been found tinged in jaundice from the absorption of bile. That these parts possess nerves is still, and with much more reason than the presence of blood-vessels, questioned by many writers: it is certain that their feeling must be very obscure, or the

Though the motion of this kind of joint must be exceedingly limited, still it possesses sufficient mobility to counteract the injurious effects of concussion to the machine during locomotion: what are vulgarly called the *springs* of the animal, are no other than the joints now under our consideration; and that they will have a spring-like effect, appears evident from the nature of the material of which they are formed. If, by any force, two bones thus united be in part separated, or displaced, their elastic connexion will restore them to their former situation, as soon as the impression, or cause of displacement, is removed. According to this view of the subject, every time a horse places his foot upon the ground, the small bones, above mentioned, are depressed by the weight of the body, but recover their original situations instantly the force, *i. e.* the incumbent weight, is taken off; so that a joint of this construction becomes highly useful to such an animal as the horse, by endowing him with that elasticity of movement for which he is so highly esteemed by the finished equestrian.

The third kind of joint is that inclosed by a capsular ligament; under which head may be comprehended all those joints of the body properly so called: it is of all the most complicated, and varies much in its construction, in different parts, according to the nature and extent of motion required. Every joint of this class is surrounded by a ligamentous bag, denominated the *capsular ligament;* and very many, particularly those of the extremities, are strengthened by others, named, from their comparative length, situation, and course, *long, short, lateral, oblique, crucial, &c.* Although the opposing cartilaginous surfaces of bones are of themselves smooth and slippery, still, when in motion, would considerable friction and conse-

quent irritation have ensued, were it not for the lubricating properties of a fluid that oozes from the contiguous parts within; in order to supply which, and to give additional glibness, the cavity is lined by a fine vascular membrane, called the *synovial.* This fluid—the *synovia* or *joint-oil,* we suppose to be secreted by the arteries of the *synovial membrane:* it does not possess any oleaginous properties, as the term joint-*oil* would seem to imply, but resembles more in its appearance the white of egg; it is, indeed, of a mucilaginous nature, and has been found to be chemically composed of the fibrine and albumen of the blood, impregnated with small portions of some neutral salts. The synovial fluid serves for the lubrication of joints, and facilitates those complex and rapid movements which we witness while the machine is in action; for, correctly speaking, the articular cartilages are never actually in contact, in consequence of the interposition of synovia; so that there can be no friction; for none can happen between a solid and a fluid—a certain degree of resistance only is opposed. In some diseases of the joints in the human subject, this secretion undergoes considerable changes: in rheumatic affections of them, it often becomes inspissated, and otherwise altered in its properties; and in gout, the joints contain, instead of it, a white solid matter of an earthy nature, known by the name of chalk-stone. Dropsical accumulations of this fluid are by no means of infrequent occurrence in horses*.

There is a substance in some parts of the body much resembling ligament in its general appearance, but differing *in toto* from it in one of its essential properties, inasmuch as it is very elastic: from which circumstance

* Vide Lecture XII. *Diseases of Bursæ Mucosæ.*

it has been named the *elastic ligament*. One of the best specimens of this is the suspensory ligament, one that attaches the sesamoid bones to the fetlock-joint. These bones, which in part support the weight of the body, move backwards and downwards at every step the animal takes, and most perceptibly during the gallop: in such horses as have very oblique pasterns, we may frequently observe that the little tuft of hair growing from the heel, if it be long, touches the ground at every bound in the canter, or gallop, the animal makes, though it was removed some inches from it before: a circumstance owing to the extension of this ligament. A considerable quantity of this substance is met with in the neck of the quadruped, in which situation it is better known by the name of packwax: also between the vertebræ of the back and loins, there is a similar composition; though here it is not equally abundant. This substance, which has received the denomination of ligamentum nuchæ, performs the very important office of sustaining the weight of the head and neck; which it does with the aid of comparatively little muscular force: a knowledge of this fact, will prevent the professional man from being led astray by the mechanical doctrine of comparing these parts to steelyards, and from undervaluing horses whose necks are of extraordinary length, or heads of greater magnitude than common, without a due regard to every circumstance connected with the structure and economy of these parts.

On the Diseases of Joints.

When the articular extremities of bones are forced out of their natural or proper situation, the case is called a *luxation* or *dislocation*. Should one bone have left the socket of the other, so that the capsular and other retain-

ing ligaments are ruptured, the dislocation is said to be *complete;* but if the displacement be only such as to allow of their articular surfaces still being, at some points, in contact, it is denominated *partial* or *incomplete.* Such accidents, fortunately for its followers, are not often met with in veterinary practice; for did they occur in the principal articulations, almost insurmountable obstacles would oppose any thing like reduction. Dislocations however are not altogether wanting in our nosological catalogue, though they may be regarded of too rare occurrence to need any description here. There is one joint in which it has happened once at this place, and thrice, in the course of a very short period, in the practice of a veterinary surgeon, then residing at Hertford: we allude to a dislocation of the patella, or stifle-bone, of which we shall give the particulars in our anatomy of that bone.

Joints are subject to inflammation from one of two causes:—either from external injury, or from undue and long continued exertion of them: we shall first detail the effects resulting from the former.

An *open-joint*, every one knows, is an accident by no means uncommon in veterinary practice; either in consequence of falls—as in the case of broken-knees, or of lacerations, or punctures from thorns, nails, or sharp instruments of any kind. The capsular ligament being penetrated in these cases, a discharge of synovia, commonly mingled with blood, oozes through the wound in the skin; which is sometimes of sufficient magnitude (especially if it be in the knee) to enable us to see the articular surfaces, or, at all events, admits of the introduction of a silver probe, by which we readily learn its nature and extent. We would remark here, *en passant*, that in many cases, commonly called open-joints, there is no

division nor injury whatever of the capsular ligament; but merely the exposure of some bursa mucosa, placed between the joint and the external wound: the discharge is of the same kind as in the former case, and we can only determine which it is by carefully probing the wound. Most of all, we are likely to make this mistake in the shoulder-joint and hock, when high inflammation and extensive swelling are present. Soon after the injury, generally speaking, inflammation is set up in the interior of the capsular ligament, which quickly extends itself over the internal surface of the joint, and is accompanied by increased heat, and more or less swelling of the surrounding parts: as a natural consequence, considerable pain is excited, which the animal seldom fails to evince, by keeping the limb semiflexed, resting it upon the toe, and carefully guarding against the imposition of weight upon it. From the acute sensibility of ligamentous parts when inflamed, the system quickly and almost invariably sympathizes; so that, in all severe cases of this nature, symptomatic fever supervenes: the pulse becomes accelerated, the horse heaves at the flanks, refuses his food, never lies down, and expresses, by various signs needless to particularize here, suffering of the most affecting description; and to such a height do these symptoms of general irritation occasionally run, that the most active and timely measures will not save the animal from falling a victim to them. The case of a horse of our own, who received a violent contusion upon the point of the shoulder, followed by open-joint, is too well impressed on our mind to escape recollection in this place: we mention it to shew, that, although a joint be not opened in the first instance, subsequent sloughing may expose its cavity.

Now, the ordinary effects of an inflammation of the synovial membrane, are: 1*st.* a preternatural secretion of synovia—hence the profuse discharge observed in these cases; 2*nd.* an effusion of adhesive matter into the cavity of the joint; 3*rd.* a thickening of the synovial membrane —a conversion of it into a substance resembling gristle, and an effusion of adhesive matter, and probably serum, into the cellular substance around, by which the external parts and those of the joint are firmly cemented together *. When the inflammation is intense, and has continued long, abscess is likely to form within the joint; and this will at length, unless it be opened, burst and discharge itself externally by ulceration. About this time, the disease commonly extends itself to the cartilaginous surfaces; which, from their vital powers being extremely weak, exfoliate—leaving denuded (worm-eaten as it were) the extremities of the bones, to grate against each other as often as the joint is moved. These more vascular parts, (the bones,) unable to bear this, take on inflammation, in their turn, and restore themselves by throwing out callus from their ulcerated ends around the joint—the nidus for ossific deposit; a process that ultimately ensues, and anchylosis is the result.

In a recent case of open-joint, we have but one indication; and that is, to heal the wound by adhesion, so as, at once, to shut up the cavity. Should the wound be a clean cut—a stab from some sharp instrument, we shall at all times be able to effect this by having immediate recourse to proper means. We are to bring the edges of the wound nicely together, after having cleaned them from

* Vide *Pathological and Surgical Observations on Diseases of the Joints*, by B. C. Brodie, F.R.S. &c.

blood, and any extraneous matter that may be present, and confine them in contact by adhesive plaster*, or by suture: in either case, to apply a bandage kept wet with an evaporating lotion. At the same time, we are to pay special attention to the quietude of the limb; which, should it be the knee, will probably best be insured by binding splints to the back part of it, so as to prevent all possibility of flexion, and by keeping the horse constantly racked up; or, if the wound be painful, and this treatment seem harsh, and improper, we must take care to confine his head by a *cradle,* lest he gnaw the bandage: an act a horse will invariably commit when his suffering is extreme. In fact, our principal object in the treatment, in this stage of disease, is to prevent inflammation in the synovial membrane; and with this view, we are to employ all the means in our power of closing, as soon as possible after the accident, the wound leading to the joint; for while that cavity, which is in its natural state perfectly circumscribed, remains open, so long will there be a disposition in its lining membrane to take on inflammation. Too often, however, either from the nature of the wound, from the admission of dirt, or from our not having been called in soon enough after the accident, we are foiled in our endeavours to produce union, and, consequently, are compelled to resort to another class of remedies. Having relinquished all hopes of accomplishing the primary indication, and regarding the case as one that must be restored by a process of granulation, we

* For this purpose the hair must be shorn off around the joint. It is not a practice commonly adopted, nor perhaps performable in some cases; but we find it to be very preferable to ligature, or suture, when the wound will admit of it.

are to lose no time in applying the actual cautery: the only effectual means left us of speedily closing the joint. Procure a cylindrical piece of iron adapted in size and curve to the wound, and with it, at a *dull* red heat, cauterize the sides of that sinus which immediately communicates with the joint; taking great care not to introduce it further than is merely sufficient to sear the cut edges of parts *exterior* to the capsular ligament, otherwise it may be productive of serious mischief. Having done so, we besprinkle the external wound with some powder, which, by its absorbent and adhesive properties, will form a kind of cement with the discharge, and, by filling up the vacuities in the divided parts, and becoming a bond of union between them, artificially prevent another eruption of the collected synovia: common flour, or linseed meal, with equal parts of either bole Armenian, alum, or charcoal, will answer this purpose very well. In cases however where there is much laceration, and the wound into the joint is of large size, we should combine fomentations with the above remedies: we may, and with advantage indeed in some parts—as in the knee, apply a poultice, and not use the absorbent dressings, until we have succeeded in abating the inflammation; but we are not to be deterred from the occasional use of the cautery, which, even here, is our surest means in eventually plugging up the joint. Bandages of all descriptions, however, are inconvenient to apply, and sometimes do harm; for which reason, and from the good effects we have observed from it, we commonly prefer the application of a blister to either poultices or fomentations. We have seen many severe injuries of this kind converted into a simple tegument wound by the simultaneous operations

of the cautery and a blister, without the employment of any other local means whatever. Should the joint remain open, a circumstance we are fully apprized of by the nature of the discharge, the cautery must be repeated with a light and cautious hand, and but moderately heated, every day until the leading desideratum in the treatment —the obstruction of the passage to it, be accomplished: and though from the excess of the external swelling and heat we may be unwilling to blister, still we have known good effects result from the practice when the symptomatic fever has not run very high; for a blister appears to do good, in these cases, not only by abating the inflammation within the joint, but, at the same time, by perceptibly lessening the secretion of synovia, and, thereby, concurring in its operation with the cautery, in restraining another emission of that fluid. Local bleeding, where we can employ it—where blood can be drawn from a vein coming from the vicinity of the joint, should almost always be had recourse to in the first instance.

With regard to constitutional treatment, there are but few cases in which purgatives are not required; and if the horse show symptoms of much irritation and pain, we are not only to administer them in large doses, but to let blood from three to six, or eight quarts, according to the urgency and duration of the case, and to repeat this operation as often as the pulse and general state of the animal appear to demand.

It has been proposed to *sling* horses under such circumstances; but, in most instances, independently of the inconvenience attending it, it is not a desirable practice: in such as are likely to prove protracted, we have seen much relief given to the animal by the simple

suspension of a very broad piece of sail-cloth under his belly, upon which he may rest himself, or not, as he feels inclined.

Should the case, in opposition to all our measures, proceed to terminate in abscess, some part of the integument will soon ulcerate and give vent to a copious discharge of pus from the joint. The treatment now becomes comparatively unimportant: so fast as we close up one place, the matter, collecting again, breaks out at another; and even should we succeed in suppressing the discharge by plugging up the joint, we are to look forwards to anchylosis, the only probable termination under these circumstances. In the greater number of instances of this kind, it is our duty to recommend that the animal be destroyed.

With regard to that affection of the joints, which, at first view, appears to be idiopathic, but which is as much the effect of injury as the disease induced in them by wound, erroneous notions seem to have crept into the minds of some veterinary practitioners, who have been represented to be the *discoverers* of morbid appearances, well known in the leading science of medicine, long before the first brick of the Veterinary College was laid: it is true, that they were not *universally* known to be of so common occurrence in foundered, or groggy* horses, but it is not true, that their existence was *unknown* even long ago by those of the profession who had paid attention to the subject. The discovery to which we here allude is, that certain joints in the horse, on being cut open, have been found in a state

* The word *founder* is now commonly used to denote *fever* in the feet, or its effects: *grogginess*, and *staleness on the legs*, have more allusion to diseases of the joints.

of ulceration : *i.e.* the articular cartilages, which, as we have stated before, are incapable of bearing active inflammation, have ulcerated, or exfoliated, and left the bones bare and ragged ; a condition of parts that, as we have also just mentioned, is succeeded by anchylosis. Now, this disease, like the former, consists in inflammation, which has its seat principally in ligamentous texture, and its origin in the synovial membrane : the only difference between them is, that in the one we have an external wound, whereas in the other the mischief is done while the cavity remains entire. In order to learn if our opinions be correct, let us take a view of its progress, symptoms, and termination ; and then investigate the causes by which it is induced. It must be confessed, that the profession lacks much information on this subject—information that can alone be obtained from a steady observance of the origin and progress of this disease in a multiplicity of cases, and a fair statement of the symptoms in each stage of it, as compared with one of the morbid changes apparent on dissection. In this way, we should arrive at something like discriminative knowledge in these cases ; but, at present, by the majority of us, all is obscured and jumbled together under the unmeaning term *groggy ;* at the very sound of which the common assemblage of remedies is summoned to our aid, and the animal subjected to such an ordeal, as not unfrequently adds fuel to the fire it was intended to abate or extinguish. It is certain, that we know, from his knuckling over, from his tottering and frequently shifting his legs while standing, from his tenderness before, and from his fumbling gait, that the horse is "groggy ;" but how few are there acquainted, not to mention the seat, with even the nature of the disease from which it proceeds. If any heat can be de-

tected in the foot, or if it be contracted, or there be that appearance of it, and mode of going, which indicate alteration of structure and the loss of elasticity in the laminæ; or if there be evident marks of disease in the flexor tendons, or bursæ mucosæ, or there be enlargements of any kind, we may form, thus far, a tolerably correct diagnosis; but when such signs are wanting, and often when they are present, we must direct our attention to the joints: too often do we neglect this inquiry, and regard it either as a case past cure, or one that is only to be relieved by the all sanative virtues of *blistering*, *firing*, and *turning-out*. Now if a case of confirmed grogginess, in which lameness has subsisted for a great length of time, arises from a diseased joint, the progress of the disease appears to be as follows. In the first instance, inflammation is excited in the ligamentous parts, and, above all, in the synovial membrane of the joint; and this will be denoted by such local symptoms as characterize its presence in other parts: *viz.* increased heat, tenderness from pressure, lameness, and possibly swelling. And it is by no means difficult to detect these signs, or at least some of them, in every *recent* case that is brought before us; and whether they be indicative of the onset, or of the more advanced stage of disease, surely we may often learn by closely questioning the proprietor of the horse, as to the duration of the symptoms, and the number and nature of prior attacks; and it is absolutely necessary that we do this, for without such information our diagnosis must be ever conjectural, and our treatment liable to error. The first effect of inflammation of the synovial membrane, is augmented, and perhaps altered secretion; the second, an effusion of lymph, or albuminous matter, by which the ligaments are agglutinated together, and the motions of

the joint interrupted; the third may be the production of abscess, but is most commonly the commencement of ulceration—the articular cartilages are removed by the absorbents, and the extremities of the bones exposed in the manner we have already described; and the fourth is a process of granulation from their denuded ends, and here commences anchylosis. Now, anchylosis, which may be defined to be, a considerable diminution if not destruction of motion of a joint, and which is by far the most common termination of these cases, is effected in this way. The articular ends of the bones having become carious, take on a restorative process—a process of granulation; in consequence of which, their edges, about the attachment of the capsular ligament, become surrounded with a coating of callous matter; and into this little spiculæ of bone shoot, which after a time coalesce around the joint, and render it less moveable, or altogether inflexible. For so long as the ossification of the soft parts remains incomplete, some motion is still preserved, in which state it is called a *partial* anchylosis: it is only when ossific union has taken place between bone and bone, and all motion destroyed, that the anchylosis is said to be *complete*. Supposing this, then, to be the nature of the disease, we shall, by scrupulous attention to all the circumstances of the case, often be enabled to give our opinion with much precision. We are aware, that the bursa behind the navicular bone is a frequent seat of it, much more so than either the pastern or fetlock joint; and it is here so embedded, that we cannot perceive swelling, though we may often heat by grasping the heels and quarters: but in the former, we may commonly detect both by a nice examination and comparison of either leg.

The inflammatory action we have been describing, there

cannot be a doubt, is the result of undue exertion of these parts. Imposing weight upon horses disproportioned to their strength, making them perform labor their powers are inadequate to, or exciting them to some extraordinary and violent efforts, (in consequence of which the interior parts of the joint are bruised and inflamed, and its ligaments sprained or lacerated,) is the most common cause of *grogginess.*

The common mode of treating these cases is bad, inasmuch as it is not varied according to the nature or stage of the existing disease; which is to be ascertained, with as much accuracy as may be, in a way we have already pointed out, before we determine on the *modus curandi.* For the sake of illustration, let us suppose a horse to be brought to us with all the symptoms of grogginess after a day's hunting, one that was perfectly sound a few days before. Being satisfied that the disease is articular, and knowing for certain that it is in its first, or inflammatory stage, our remedies ought to be of that class which tends to lessen inflammation. Local bleeding is always highly beneficial; after which, we may immerse the leg either in cold or warm water, or apply bandages wetted with an evaporating wash and poultice the feet: at the same time, we are to exhibit a strong dose of aloes, and strictly enjoin a state of quietude. We are not to be satisfied, however, with one bleeding (which may be either from the toe or veins above*, according to the joint affected) but to repeat it daily, or every second, or third day, so long as the inflammation continues unabated: and this we may fairly conclude to be the case while the lameness remains undiminished †. Having, in this way, subdued the

* The pastern, or cephalic vein.

† The directions we commonly give are these: that lbs. iv. of

acute or primary attack, we are no longer to persevere in the use of depletive and emollient means, but to substitute counter-irritant; and the best we have are blisters: for the lameness, or stiffness yet perceivable, is probably the effect of some effusion of fluid into the joint, as well as thickening and agglutination of the capsular and other ligaments, which nothing will so speedily remove as the frequent application of blisters. The Infus. Lyttæ will answer the purpose; so that there will be no necessity for trimming. All perceptible heat and swelling having left the leg, and the lameness being relieved, the stiffness, so often the sequel of lameness here, will be got rid of sooner by turning the horse into a *loose* place: indeed, should the case have been of long duration, it is an excellent practice to give the animal a winter's run in a straw-yard, where his feet and fetlocks will be continually soaked in muck. Firing is rarely useful, where blisters do not succeed to our wishes; but it may be tried, and ought to be in such horses as have experienced former attacks of the same nature.

When the disease however is only manifested by lame-

blood be drawn from the toe; (of each foot, should both be affected;) that the horse stand in a tub containing warm water enough to cover the fetlock during the day; that the foot be poulticed with linseed meal at night, and the leg encircled by a linen bandage, wetted with the Liq. Plumb. Subacetat. Dilut. that a brisk cathartic be given; and that the horse though tied, never be racked up; but be kept littered down, so that he may be allowed to lie, as soon as he is taken out of the bath. Next day, or the day after, we bleed again from the toe, or pastern, and repeat it every succeeding or alternate day, until the heat has become imperceptible, and the lameness diminished. At this time, we order Infus. Lyttæ. ℥j. to be rubbed around each coronet at night, and the bandage and white wash to be discontinued. And now the sponge boots may be worn with benefit, or, should they not be used, the feet must be kept continually moist with clay-stopping.

ness—without any discoverable heat or swelling;—when it has been of very long duration;—and when it has been preceded by frequent relapses of such symptoms as we have already detailed:—we may suspect ulceration to be present. Under such circumstances, it is evident, however much the most active blisters, and painful firing may palliate the symptoms, how very injudicious must that plan of treatment be, which compels the animal to compress, and grate upon each other, the ends of bones whose articulatory surfaces are already destroyed by caries: do what else we may, *rest*, if we hope to relieve an animal lame from such a cause, appears to be indispensable. Blisters kept open, or frequently repeated, must here constitute the chief of our treatment: the actual cautery, however, may now and then be used with advantage, in a more severe manner than we have in general recommended; the object being to excite counter-irritation, and subsequent discharge. Setons or issues are always proper, and frequently very serviceable in these cases. At the Veterinary College of late, it has been the practice to insert a piece of tape through the fatty frog, in cases of disease of the bursa of the tendo perforans, and, we understand, with much good effect: the *frog-seton-needle* is used for the purpose, which is thrust into the cleft of the frog—previously pared out to receive it, through the fatty frog, and out at the heel.

We are not to expect to do more for these subjects than alleviate their suffering, or, what amounts to the same thing, diminish their lameness: restoring them to soundness is quite out of the question. Should our endeavours to render the animal again serviceable prove unavailing, in consequence of the advanced state of disorganization these parts have already undergone, our last resource

is that of dividing the nerves running to the affected joints; for instructions concerning which, we must refer to our lecture on neurotomy.

On Ossification.

We cannot close the subject of bones without saying a few words on this curious process. Those firm, hard, and compact parts of an animal which we call bones, were originally cartilage—nay, even nothing more than membrane during the earlier periods of fœtal existence. Anatomists have been in the habit of considering these organs in their primitive state, as consisting of a gelatinous or cartilaginous substance, in which the osseous matter was deposited: but Mr. Howship, surgeon, in an interesting paper on this subject, has shown that they are originally formed of two membranes, the same that afterwards become the periosteal and medullary membranes. Within these, cartilage is continually deposited, until the whole becomes a substance of firm, solid texture, resembling in shape the bone it has yet to be converted into; and so much precision has Nature observed in this respect, that we shall find the fœtus, still no larger than a mouse, corresponding in form, with the utmost exactness, to the horse that has arrived at maturity. Of the truth of these remarks, we may, at all times, satisfy ourselves, by examining the fœtus at different periods prior to birth. This cartilage, as we stated before, possesses very considerable vascularity, so that in the fœtus we can readily inject it with size and vermilion: it is thought by some, that its arteries increase in size just before ossification is about to take place; and, whether this be the case or not, it is certain that they admit very readily of injection at this period, and are so numerous as

to be seen ramifying thoughout every part of the cartilage. At an early period of fœtal being, the cartilage becomes firmer, assumes a whiter appearance, and loses much of its former flexibility; changes, which, on minute examination, we find to be dependant on a deposition of earthy or bony matter within it. This substance, which chemists have ascertained to be phosphate of lime, physiologists suppose to be separated from the general mass of blood by the minute terminations of arteries, and to be spewed forth by them into this cartilaginous nidus. Now, the cartilage, unlike the bone it supplies the place of, is perfectly solid—in it there is no hollow nor space whatever; it is necessary therefore, prior to the deposition of bone, that a portion of it be removed: this the absorbent vessels effect, and continue to do in exact ratio with the deposition from the arteries. The process of ossification first commences in the very heart of the cartilage; so that if we make a section of it at this time, we discover a minute speck of bone in its centre—the other parts as yet remaining unchanged; and this bony nucleus increasing in magnitude gradually extends itself by divergent osseous threads, or fibres, to the surrounding parts, until, at length, the interior exhibits a fine network of bone without any remnant of cartilage. This constitutes the cancelli of the bone, and it is this that is first formed: and as this part was originally solid, it is evident that there must be a very considerable absorption of cartilage before it can exhibit the cellular appearance so remarkable in the perfect bone. The shell of the bone is next composed; and now its body is completed. The extremities, (that is if it be a cylindrical bone,) though they ossify in a similar manner, are at this time cartilaginous: the radiated osseous fibres from the centre do

not extend thus far—they have separate foci, or central points of ossification, which do not make their appearance for some time after the completion of the body; so that even at birth the extremities of many bones are still gristly. In consequence of this, the ends of the long bones, even after they have become bony, are only, at first, united to the body by cartilage, and are called *epiphyses*, or *appendices;* and it is not until the growth of the animal is considerably advanced that a complete bony union is effected: if we macerate the long bones of the legs of a foal, twelve months old, we find that their ends separate, and hence it is that they are unfit for the construction of a skeleton.

As far as our own observations enable us to give a statement of the priority of ossification in different bones —the vertebræ, ribs, pelvis, and lower jaw first undergo this change; subsequently, the bones of the head, the scapulæ, and larger bones of the extremities; lastly, the pastern, coffin, and navicular bones. In the foal, at birth, ossification has made very considerable advances, comparatively to what we find to be the case in the infant, puppy, or kitten; and the fact of such early maturity in the formation of this animal, cannot fail to strike us, when we consider its habits of life, as a beautiful instance of the providence of Nature, whose means are always so suitable and so adequate to Her ends. Unlike the human female, or the beast of prey, the mare, a graminivorous animal, cannot lay up a store of food; although she is one that constantly lacks it, and is, consequently, compelled to go in quest of it, and take her offspring with her. Thus we find, shortly after being dropped, the foal can not only stand, but is able to follow its dam in pursuit of food; indeed,

so much strength does it possess, that, while still but a few days old, it will frisk and play around its anxious mother, with all the powers, comparatively speaking, of a child three or four years of age. What is the precise stage of ossification in the fœtus at birth, or what may be the periods at which particular bones take on this change, and complete it, are questions we are not prepared to answer: and though we are not aware that such a knowledge would much benefit us in practice, still it is what would gratify every one who feels a lively interest in his profession. We are in the habit of regarding horses as perfectly formed at five years old, as we would a man who has attained the age of twenty-one; but there are constant exceptions to these rules, depending on constitution, species, mode of rearing, and perhaps sex. Those bones which are not mainly employed in sustaining the weight of the animal, but are only auxiliary props of support, appear to be the last to take on a bony structure: for this reason, ossification of the coffin bones precedes that of the navicular; and the pastern bones become bony before the sesamoid. With regard to the coffin bone, that portion of it which enters into the composition of the coffin-joint, remains longest cartilaginous: whereas, of the navicular, the surface forming part of that joint, is soonest converted into bone.

Division of Bones.

Bones have been divided, according to their external figure, into four classes: *viz. cylindrical, flat, spherical,* and *irregular*. In the first class may be comprehended all the long bones of the extremities—such as those of the arm, thigh, and legs; in the second, those of the head—the frontal, parietal and nasal bones, and the sca-

pulæ, and bones of the pelvis; in the third, the patellæ, and those of the knee and hock; in the fourth, such as cannot be classed under either of the other heads—the coffin bones, vertebræ, lower jaw, and navicular bones.

Prominences and Cavities of Bones.

In describing these parts, we shall have frequent occasion to point out various projections, cavities, and holes, all which we shall designate, as nearly as may be, by the same terms as those used to denote similar appearances in human anatomy. Thus, we shall give the name of *caput*, or *head*, to any round prominence upon the upper part of a bone, and that of *cervix*, or *neck*, to the part immediately below it; *tuberosity*, to any unequal protuberance, and *spine*, if it terminates in a sharp ridge; *condyle* to any flattened articular eminence; *coronoid*, or *coracoid* process, if it bears any resemblance to a bird's beak; *mastoid*, when like a nipple, or teat; *styloid*, if it is shaped like a pencil; and *spinous*, when sharp and pointed like a thorn. Of the *cavities*—a shallow cavity is called *glenoid;* a deep one, a *fossa;* a long and narrow one, a *furrow*, or *canal:* beside these, there are *notches, sinuosities, sinuses*, &c. Of the *holes*—if they perforate the bone, they are called *foramina;* if not, *depressions*, or *pits.*

LECTURE XVII.

On the Skeleton.

THE word *skeleton*, in anatomy, is applied to the bones of an animal, divested of the flesh and other soft parts, joined together in their natural order. A skeleton is said to be *natural*, when the bones are connected by their own ligaments; *artificial*, when by means of wire.

In taking a view of the skeleton of the horse, we find that many parts of it have a close resemblance, in their general outline, to correspondent ones of the living animal; *e.g.* the head, the chest, and the legs below the knees and hocks: on the contrary, the form of others is so completely changed that we are unable to trace the slightest similitude; *e.g.* the neck, loins, arms, and thighs.

It has been observed, that a horse in his general configuration, when his parts are well proportioned, will, with the exception of the head and neck, "come within the square*;" a remark, in a general point of view, well worth consideration, if it be borne in mind, that out of the nu-

* *An Enquiry into the Structure and Animal Œconomy of the Horse*, by RICHARD LAWRENCE, V. S.

merous deviations from this figure, many of them are attended with peculiar advantages.

The skeleton may be divided into three parts :—head, trunk, and extremities ; in describing which we shall adhere to the method commonly followed by teachers of human anatomy, and begin with the trunk. This part has been subdivided into the spine, ribs, and pelvis : first let us consider the

Spine.

The spine, vulgarly called the back-bone, is that chain of bones, which, in quadrupeds, extends in a more or less horizontal direction from the occiput to the extremity of the coccyx. In consequence of its great length, it constitutes the bony fabric of the neck, back, loins, and tail.

Perhaps the best idea of its shape may be communicated by saying, that it resembles that of the common S, if we give to that letter an additional curve ; *e.g.* ( ) (. Proceeding from the summit of the head with more or less crest-like bend, the spine sinks into a concavity at the hind part of the neck ; from which, in its course through the back, it deviates but little from the horizontal line ; in the loins, however, an arch of great strength and regularity is begun, which, more posteriorly, is completed by the declivity of the tail.

From the centrical position of the spine, we find, on examination of the skeleton, that it is sustaining the head, neck, and trunk, and transmitting the weight of these several parts to the limbs: and such is the effect of this intermediate connexion, that, while all these parts are influenced by its motions, in progression, its own movements are regulated by those of the limbs. To this universal concatenation of the bones to the spine, which is to be

regarded as the key-stone of the building, and to its peculiar construction, are attributable the rapidity and ease with which a horse performs his various actions.

The spine is made up of many small bones, called *vertebræ;* and these are connected together by cartilage and ligaments of an elastic nature, so as to form numerous joints: had it been constituted of only two or three bones, with joints between them, material loss of resisting power, as well as motion, must of necessity have resulted. Receiving it as an axiom, that joints are weak, insecure, and liable to dislocation, in proportion as they possess extensive motion, and taking it for granted, that the converse of this is equally true, we shall discover that much wisdom is displayed in the formation of the vertebral chain, and perceive that the objects sought after in its construction were extreme mobility, and great strength. The accomplishment of the former is well seen in the several motions of the neck and tail; and the completion of the latter is equally well evinced by the immense weights the spine is capable of supporting, and the almost unheard-of accident of dislocation of its vertebræ.

Seeing, then, that Nature has conbined in the construction of this part, such opposite mechanical properties, we are induced to inquire by what inimitable mechanism these objects have been attained. In the first place, the vertebræ are so dovetailed together, that their joints possess considerable strength, but exceedingly limited motion; and had there been but two or three of these articulations in the spine, but few of the motions it is now capable of, could have been admitted. But instead of having only two or three joints, we find that the spine is constructed, including those of the tail, with upwards of forty; so that if we admit the quantum of motion between

any two vertebræ to amount (for the sake of illustration) to the inclination of one-fourth of an inch in every direction, the aggregate range in the extreme parts will be nearly equal to a foot.

The bones of which the spine is composed have been divided into *true* and *false* vertebræ: the first class comprehends all those that have the common characters of a vertebra, and are moveable, one upon the other; the second, those that are either somewhere deficient in such marks, or are immoveably united together. The true vertebræ are distinguished into three kinds, named *cervical, dorsal,* and *lumbar:* of the first, there are seven; of the second, eighteen; and of the the third, five; making altogether thirty true vertebræ. The false vertebræ, according to the usual mode of describing them, cease to be called vertebræ; but are collectively considered as two bones, by the names of *sacrum,* and *os* vel *ossa coccygis.* The first is composed of five pieces, the coccyx of thirteen; amounting together to eighteen bones, or, in fact, false vertebræ; which, added to the thirty true, make forty-eight, the total number of the bones of the spine.

True Vertebræ.

The true vertebræ have a common resemblance, so that a description of any one of them will apply to almost all the others, so far as regard general characters; for which reason, and to avoid repetition, we shall point out the constituent parts of one that differs least of all from the majority of the others. Of this description we find several of the posterior dorsal: suppose we select the twelvth or thirteenth of this division.

We find that it is composed, first, of a round, solid part inferiorly, called its *body;* of a spongy or porous

texture, convex upon its anterior, and concave upon its posterior surface. Secondly, we observe a bony arch extended transversely across the upper part of the body, leaving a round hole of considerable size between them, called the *foramen spinale—spinal,* or *medullary hole;* the use of which is to assist in forming an osseous canal for the lodgment of the spinal marrow. From this bony arch arise seven processes: four of them are short—two jutting from its fore, two from its back part, in an oblique direction—and these are denominated the *articular,* or *oblique processes;* two others, longer than the former, extended from its sides, are called *tranverse processes;* the seventh and longest arises from its upper part, and from its pointed form takes the name of *spinous process.*

Having thus briefly described the common characters of a true vertebra, we shall take notice of the diversities in the external structure of the different classes, as well as the peculiarities by which many of them of the same class are distinguished from one another.

Cervical Vertebræ.

The vertebræ of the neck are seven in number. They are larger than those of either of the other classes, and differ more in their external form from one another. They are somewhat of a quadrangular figure. The body of a cervical vertebra is of an oblong shape, presenting a smooth round prominence anteriorly, and a cup-like cavity posteriorly, which are fitted to a similar excavation and rotundity upon the bodies of the opponent vertebræ: along its lower part runs a sharp ridge, which by some has been described as an inferior spinous process. The transverse processes, proceeding from the body as well as from the bony arch, are bifid at their extremities,

and perforated in the centre, for the transmission of the vertebral artery and vein. The articular processes are large and broad: the anterior are directed obliquely upwards and forwards, and have surfaces of articulation upon their superior parts, looking inwards; the posterior are pointed downwards and backwards, and possess articulatory planes upon their inferior parts, facing outwards: both the anterior and posterior articular processes form joints with corresponding projections of the vertebræ situated before and behind them. The *spinous* processes are short; but they vary somewhat in length. The *spinal foramen* is round, and of large dimensions.

The peculiarities of the cervical vertebræ are as follow. The first vertebra—erroneously in quadrupeds called the *atlas*, for the head is rather suspended than supported by it—differs in toto from any of the others: it cannot, indeed, be said to possess the common vertebral characters. It is simply a ring of bone with broad projecting sides. It has no body; the place being supplied by a process, called the processus dentatus, of the second vertebra. Its articular processes are directed *horizontally* forwards and backwards: the anterior are scooped out internally, to receive the condyloid processes of the os occipitis; the posterior are slightly convex, to adapt themselves to the anterior of the second vertebra. The transverse processes are broader and stronger than those of any other bone of the neck, *not* bifid, and are perforated by three pairs of foramina. The spinous process is altogether wanting. The spinal hole is larger than in any other vertebra; but in the articulated spine is much reduced in size by the vertebra dentata.

The second cervical vertebra, called, from a peculiar projection upon the fore part of its body, the *dentata*, is

of a different form from the others. It is the *largest* cervical vertebra; exceeding the others however more in length than in breadth. The processus dentatus, or tooth-like projection, is round and smooth underneath, where it forms a joint with that part of the atlas in which the body of the latter is deficient; thereby in some measure supplying the defect. Upon the sides of this process, near its root, are two oval surfaces of articulation, which correspond to the anterior articulatory processes: they are more extensive than the concavities upon the posterior part of the atlas, with which they are joined, thereby admitting of greater motion in the latter. The transverse processes are smaller, and placed more backward. Its spinous process is bifid *posteriorly.*

The third, fourth, and fifth have a general resemblance, and bear the common marks of cervical vertebræ. The sixth has *no* ridge along the under part of its body, or inferior spinous process. The seventh is the smallest of the cervical vertebræ, and approaches in its general figure to that of the first dorsal. Its transverse processes are short, round, and not bifid; nor are they perforated by any foramen. Its spine is more elevated, and sharper than that of any other. At the back part of its body are two small semilunar hollows; which, with similar depressions upon the front of that of the first dorsal, form sockets for the heads of the two first ribs.

Dorsal Vertebræ.

The dorsal vertebræ, or bones of the back, are eighteen in number*, and are smaller, generally speaking, than either the cervical or the lumbar. They are remark-

* A spine in our possession has nineteen dorsal vertebræ.

able for the extreme length of their spinous, and the contrasted shortness of their transverse processes: the articulatory surfaces for the ribs form an additional characteristic of them.

Each dorsal vertebra presents, upon the anterior part of its body, a smooth round head, and upon the posterior, a circular, but superficial cavity; by which means these bones are nicely fitted to each other. Their articular processes are short and oblique: the surfaces of the anterior face upwards; those of the posterior, downwards and backwards. The transverse processes are short, obtuse, and somewhat incurvated: the extremities of them furnish articulatory surfaces for the tubercles of the ribs. The spinous processes are long and flattened, and terminate in rough blunted extremities: before they have sharp edges, but behind are more or less grooved. Four surfaces for the articulation of the heads of the ribs are seen upon the sides of the body. The spinal foramen is small and round. At the roots of the spinous processes are small excavations or notches; which, in the articulated spine, together form foramina, for the exit of the dorsal nerves.

The first dorsal differs in some respects from the others. In its general figure it approaches to that of a cervical vertebra. The shape of its body, and the length of its articular processes distinguish it from all the other dorsal; the length of its spine, and the shortness of its transverse processes, together with the surfaces of articulation for the first ribs, specificate it from a cervical; the peculiar shape of the spinous process is of itself a sufficient characteristic from both.

It is by no means difficult to arrange the others according to their relative places in the skeleton, if we examine

closely the form and comparative length of their different spines. The second, independently of its longer spine, is at once recognised by its anterior articular processes. The third, fourth, fifth, sixth, and seventh, by the inclination and greater length of their spinous processes. The eighth, ninth, tenth, and eleventh, may be selected not only by the progressive shortening of their spines, but by their regular increase in breadth, so that they are of a different shape from those anterior to them. The twelvth, thirteenth, fourteenth, fifteenth, and sixteenth spines resemble much in form those of the lumbar vertebræ. The eighteenth, and generally the seventeenth, have no articular surfaces upon their transverse processes, but *whole* ones upon their bodies, for the reception of the heads of the seventeenth and eighteenth ribs. The spinous process of the fifth is generally the longest; forming that part which is called the top or point of the withers.

Lumbar Vertebræ.

The lumbar vertebræ, or bones of the loins, are five in number. They are at first sight known from any others by the remarkable length of their transverse processes. Their bodies are somewhat larger than those of the dorsal, but smaller than those of the cervical.

The body of each lumbar vertebra presents a smooth convexity before of a heart-like shape, and a concavity behind of corresponding figure and dimensions. The anterior articular processes are hollowed out internally, receiving between them the posterior articular of the vertebra before; the posterior, which are less distant from each other, are round and smooth inferiorly, and are embraced by the anterior articular processes of the vertebra

behind. Thus a kind of dovetailed union subsists between these bones. The transverse processes are long, flattened above and below, and stand out at right angles from the body. The spinous processes are broad, flat, and nearly of the same length with those of the four or five last dorsal. The foramen spinale is larger than in the dorsal, and is somewhat of a triangular shape. There are grooves upon the posterior part of the body of each vertebra, which together form holes to give exit to the lumbar nerves.

The first, second, and third lumbar vertebræ may be known by their articular processes being nearer together, and the greater breadth of their spines; the fourth by its possessing a surface for articulation with the fifth on its transverse process, and the diminution in width of its spinous; the fifth from its general resemblance to the first bone of the sacrum, from having four articulatory surfaces marked upon its transverse processes, and from the extreme narrowness and peculiar incurvation of its spine.

Os Sacrum.

The sacrum in the colt consists of five pieces, but in the adult horse these have become so united as to form but one and the same bone; and as such we shall describe it. In its general figure it resembles the lumbar vertebræ, from which it declines with a gentle curve—being convex externally, smooth and concave within, where its surface is opposed to the pelvic viscera.

On the fore part of the body is an oval convex articulatory surface; corresponding to the concave one on the body of the last lumbar, to which it is joined. The sacrum has only two articular processes, which, though

wider apart, are similar in form to the anterior of the lumbar vertebræ. The transverse processes, thick, broad, and strong, extend throughout the whole length of the bone: each of them is marked in front by a smooth surface, adapted to similar planes on the last lumbar vertebra. The spinous processes differ from those of the loins both in direction and shape: the latter lean forwards and diminish in breadth from the first to the last, these slope backwards and downwards and increase in breadth. The foramen spinale is triangular, and decreases in size.

There are eight pairs of foramina in this bone: four externally, and four of larger size internally; through which the sacral nerves take their course. Grooves are seen between the articular and transverse processes, which with the last vertebra of the loins make complete foramina: similar notches in the inferior extremity become foramina when joined with the first bone of the coccyx.

Ossa Coccygis.

The coccyx or tail is composed of fifteen pieces, which in their general character resemble so many little imperfectly formed vertebræ. The two, and sometimes three, first pieces have transverse and spinous processes; the first indeed frequently has two articular upon its fore part, by which it is attached more firmly to the lower end of the sacrum. The spinal canal is also generally perfect in these bones. In the fourth piece we commonly lose all appearance of transverse process, and the bony arch itself is defective, as well as in the fifth, sixth, and sometimes seventh; so that the spinal channel is here only in part bony, being completed in the recent subject by ligament. The remaining pieces can scarcely be said to retain the vertebral form; but merely consist of so many small cylin-

drical bones, which differ only from each other in regard to their size.

The bodies of the vertebræ are united together by an elastic substance, whose texture is of that peculiar kind called *cartilago-ligamentous:* to its extreme flexibility may be attributed that springiness of movement in the animal's gait, which the experienced horseman alone can properly estimate. Why young horses are more remarkable for such a quality than old, arises from the circumstance of the intervertebral substance rarely being free in the spines of the latter from osseous deposit. To shew how extremely flexible and elastic this part is in horses and asses, we would adduce, as a familiar illustration, the declinations and incurvations of the spine that the latter animal exhibits in writhing under the scourge of his merciless master, or in passing under a fence of inconsiderable height: indeed were it not for this kind of union, a horse's back must be broken every time he is said to sink under oppressive burdens.

Between the articulatory processes of the spine are joints, furnished with capsular ligaments, and a secretion of synovia; each of which in itself possesses but a very limited degree of motion.

The cervical vertebræ are the most moveable: there are indeed but few motions of the head in which they do not participate. On the other hand, the dorsal are so constructed and their intervertebral substances so much thinner, that they are incapable of much motion; had they been equally moveable with the cervical, the functions of the thoracic viscera, whose regular performance is so intimately connected with the support of life, must have received much interruption, if not occasional suspension. To compensate however for this comparative fixedness

in the back, Nature appears to have centred the mobility of the trunk in the vertebræ of the loins, parts whose unrestrained natural action is of the utmost consequence in progression: only observe, as a proof of this, the gait of a horse said to be *broken-backed*—whom the horse-dealers call "a german"—and we shall be convinced that the trunk owes its flexibility and adaptation to the motions of the limbs in progression, very principally to the flexures of the loins.

The cervical vertebræ receive the weight of the head, and transfer it to the trunk; give attachment to a thick mass of muscle; and by their spines afford firm connexion to the strongest ligament in the body. Between the atlas and dentata, there is a small space where the spinal marrow is unprotected by bone: this defect has given rise to a mode of destroying an animal called "pithing;" which consists in introducing a knife or other sharp-cutting instrument through the skin, for the purpose of dividing the medulla at this part.

The dorsal vertebræ constitute the superior part of the trunk; afford articulation to the ribs; and serve for the attachment of muscle and ligament.

The lumbar, from the length of their transverse processes, defend those viscera unprotected by ribs; and offer a considerable surface for the attachment of some very powerful muscles.

The sacrum appears to have no other mobility than what is necessary to prevent concussion. The extent and variety of the motions of the coccyx, are too well known to require any remark in this place. On the degree of incurvation which the sacrum and coccyx form with the lumbar vertebræ, depends the position of the tail with regard to the trunk: hence the common observations that

a horse's tail is *well or ill set on.* Independently of the symmetrical improvement which the *high tail* is allowed to confer, it is attended with no inconsiderable advantages in the construction of these parts: it affords more space to the pelvic viscera, and gives more freedom, if not power of action to the muscles attached to the sacrum and coccyx.

Diseases of the Spine.

The spines of most old horses exhibit marks of disease, though we are not aware of any morbid change in the generality of them during life: this probably may be the reason why our authors on farriery have been so silent with regard to this part of pathology. The most common, indeed we may say, almost the only diseases of the spine to which horses are subject are

Fracture and Anchylosis.

In the phraseology of farriers and horse-dealers, these cases are known by the names of *broken-back, chinked-back,* and *german;* stable terms simply denoting, that a horse has received some injury in the back or loins by which his action is impaired. Horses that are cast, now and then have their *backs broken; i.e.* the vertebræ are either simply fractured, or fractured and displaced; (for one cannot take place without the other;) in which latter accident the horse is not unfrequently killed on the spot from injury to the spinal marrow: or if the fractured portion of bone be merely partially driven out of its place, so as to occasion pressure to the marrow, palsy of the hind quarters, or a convulsive or spasmodic action of them, resembling stringhalt, will be the probable effect. Contrary to what we should expect in these cases, the accident

seldom or never happens in the act of casting, but is the sudden effect of some violent effort of the hind quarters to disengage themselves while the animal is lying upon his side: all at once his struggles, but now alarming and resistless, cease, or become comparatively feeble; and probably at the same instant a snap is heard in the back. Several instances have occurred, however, in which the operator has known nothing of the accident until the horse has been released, and found unable to rise—or if able to get up, without the power of walking to the stable; and we have been told of one where the animal regained the stable before any symptoms had manifested themselves: showing that the vertebra, though broken, may remain in its place for some time afterwards. The vertebra fractured is either one of the posterior dorsal, or the anterior lumbar; and the substance of the spinal marrow is generally so contused, that its organization is wholly or partially destroyed. Here is an example then, and the only one at present known in the horse, of a bone being broken by the force of muscular action; for this is simply the explanation of an accident that has been referred, by those unacquainted with the nature of it, to some mismanagement in casting. So far as our inquiries have gone, it has always been judged expedient to put the animal to death*.

With regard to anchylosis, the disease has its origin in

* We have been fortunate enough to have met with no accident of this kind; and this we account for by seldom having occasion to cast horses, the subjects of operation. Surely both firing and nicking are more conveniently performed standing—indeed with the exception of castration and neurotomy, we—unless it be some extraordinary case—forbid such a measure, not only as dangerous, but quite unnecessary.

an inflammation of the ligamentous structure connecting the different vertebræ; and this may be brought on by sprain, laceration, or other injury of it, as happens from casting horses, from overweighting them, or from violent exertions in racing, leaping, suddenly turning or pulling them up on the haunches, &c. The lumbar vertebræ are commonly the parts affected, as might be anticipated from what we have already stated respecting their motions.

The morbid alterations discovered in the spines of these horses, if the disease have been of long duration, are well known to knackers, who are in the habit of slaughtering such subjects: they call them *callus*, a name by no means inapplicable to their nature. The best description we can give of them is contained in the subjoined case of a broken-backed horse, which we have lately dissected.

A brown horse the property R——— Esq. of Cambridge, had been about two months the subject of disease in the spine, which could not be traced to any hurt, or other evident cause. The straddling gait, the difficulty to turn round, the loss of general flexibility of the back and loins, more particularly the latter, indicated the nature of the case. As the malady was recent, as far as regarded the presence of these symptoms, such treatment as we think most appropriate in these cases was adopted: *viz.* the repeated application of blisters—or other stimulants to the spine, which were constantly kept discharging, combined with the occasional administration of purgatives. This was persevered in without the least benefit for the space of a month, at the expiration of which time, the horse was by consent of its owner destroyed.

On examining the spine, the disease was found to be greatest in the loins, and to be included between the twelfth dorsal and last lumbar vertebra. Several round

bony knobs of different sizes projected from the arches and bodies of the lumbar vertebræ, and there were others near them in part cartilaginous, and in part bony. Many vertebræ were anchylosed, others still possessed a limited degree of motion: also the transverse processes were in some places joined by a similar substance. Within the spinal canal there was a small bony eminence, which, no doubt, had it undergone much accretion, (in event of the animal being kept alive,) would have pressed sufficiently upon the marrow to have occasioned a paralytic or convulsive affection of the hind quarters.

The cervical vertebræ, though less frequently diseased, are not altogether free from this affection. The atlas is sometimes incrusted by bony deposit. We have specimens before us of anchylosis between the dentata and third cervical vertebræ; and between the sixth and seventh. In the former instance a remarkable curvature is formed, in such a manner that the marrow must have sustained considerable pressure; indeed there can be little doubt that suppuration had taken place in the theca, for below we perceive an opening into the vertebral canal, through which the matter discharged itself. In regard to them, we may observe, though we are unacquainted with the origin of these specimens, that the common excitants of disease are external injuries—such as blows upon the poll, and pressure and contusion of it from hanging back in the halter, as young horses are apt to do—and that the disease itself in its worst form is known by the name of *poll-evil;* which rarely or never invades the bones without being followed by necrosis and anchylosis.

The extent of anchylosis varies much, however, in different subjects, according to the severity and duration of the disease. We have one spine in which all the bodies

and transverse processes are completely fixed by ossification, as far forward as the fourth dorsal vertebra: another, in which in addition to extensive anchylosis, a bony tumor of large dimensions projects downwards, at least four or five inches, into the cavity of the chest: a third, in which a long spicula of bone dips down from the sixteenth and seventeenth dorsal. In all these preparations, the spinous processes of the latter dorsal and those of the lumbar partake more or less of disease.

The connexion between stringhalt and broken-back, we suspect to be intimate: a reference to Lecture XII. will disclose our theory of the former disease, and prevent the necessity of any repetition in this place.

LECTURE XVIII.

Pelvis.

THE Pelvis forms the posterior boundary of the trunk, and is composed in the horse of three bones:—the two ossa innominata, and the os sacrum. Although the coccyx in its dependent position may be said to enter in part into the formation of the pelvis, it will be hardly so considered when erect; we have therefore chosen rather to omit it altogether in our description of this part: and having already described the os sacrum, we shall proceed at once to a consideration of the

Ossa Innominata.

THE ossa innominata, hip, or haunch bones, are two of the largest bones in the skeleton. Each in the colt is made up of two pieces: the larger is called the os ileum; the smaller, in allusion to the human spine, has been subdivided into two portions, named the os ischium and os pubis; ossific union, however, takes place so early in horses, and all traces of any former separation become so completely effaced, that we think it more proper to treat of them but as one.

The os innominatum forms the lateral and inferior parietes of the pelvis; the upper and back parts being bounded by the os sacrum. It is broad above, contracted below, thick and strong where it forms the socket for the thigh bone. Along its upper part runs a waving rounded margin, called the crista; which is terminated at either extremity by a rough projection: the one pointing forwards and outwards is denominated the anterior spinous process; the other directed backwards and inwards, the posterior spinous process. Below the crista is a triangular portion of bone, the external surface of which is called the dorsum; the internal, the venter. Projecting from the inferior part of the bone is a flat process, whose extremity is rounded and roughened, to which the name of tuberosity has been given. The acetabulum is that bony cup intended for the reception of the os femoris: it is deep, surrounded by a prominent lip of bone interrupted by a notch at the inferior part, and is marked within by the insertion of the round ligament. The large oval opening under this is the foramen magnum. The symphysis is the place of union between the two ossa innominata. The venter exhibits near its middle an oval depression, which part rests upon, and is firmly attached to, the transverse processes of the two first pieces of the os sacrum; the anterior spinous process of the latter being situated immediately between the posterior spinous processes of this bone.

The two ossa innominata are firmly joined at the symphysis, by a substance partaking both of the nature of cartilage and ligament, which in old horses is commonly converted into bone. These bones are connected to the trunk by cartilages, ligaments, and muscles; for which

last they present an extensive surface of attachment. The foramen magnum is filled up with ligament in the recent state; and the acetabulum is lined with cartilage.

The large circular opening between these bones—the *cavity of the pelvis,* whose boundaries form what is called the *brim of the pelvis*—is directed horizontally forwards and backwards: it is larger in the mare than in the horse. The posterior opening, over which the os coccygis hangs, is called the *outlet:* it is comparatively of larger size in quadrupeds than in the human subject, from which circumstance, and from the extreme mobility of the coccyx, parturition in them is attended with much less pain and danger.

We not unfrequently meet with pelves with incrustations of bone about the acetabulum, which would appear to originate in disease of the hip-joint. We have one pelvis in which the foramen magnum is much diminished in dimensions.

Sternum.

The sternum, or breast-bone, is composed of seven pieces, united together by intervening cartilages. They are all nearly of the same size and figure, with the exception of the last, a piece wholly cartilaginous, which from its shape has received the name of ensiform cartilage. Protruding from the anterior extremity of the sternum, is a portion of cartilage, in its figure not unlike the keel of a ship: its fore part may be distinctly felt, and sometimes seen, in the living horse; its posterior end becomes gradually narrower, and adheres firmly to the under part of the bone. Each bone has indentations upon its sides, marking the insertions of the cartilages of the ribs.

Costæ.

The costæ, or ribs, together with the dorsal vertebræ and sternum, constitute the osseous parts of the chest, and protect the contained organs, upon whose unconstrained operation life itself depends. They are thirty-six in number, eighteen on either side; sometimes however there are thirty-eight, and occasionally forty; of which we have specimens in the museum at this place. In their general characters they resemble each other; though there are some few peculiarities among them, of which we shall presently take notice.

The head is the superior part of the rib, and is received into the cavity formed between the bodies of two dorsal vertebræ; the contracted part below the head is called the cervix, or neck; lower still is the tubercle, a small projection, articulated with the transverse process of the vertebra.

The ribs are more or less contorted or twisted in their figure, and are fixed in such a manner to the spine, as to form so many bony arches upon the sides of the chest, the convexities of which are turned outward. Their anterior margins are thin and sharp; their posterior smooth and round. Upon their lower extremities are oval depressions, roughened by the attachment of the cartilages.

The first rib is shorter and stronger than the others. Its upper part is thicker and rounder, and its lower considerably flatter and broader than those of any other; and the concavity of its arch is turned forwards: in fact, once seen it can never be confounded with the rest. The second is a remarkably straight rib, from which circumstance, and from its being longer than the first, we shall have no difficulty in recognizing it. From the second the

ribs gradually increase in length, and somewhat in breadth, to the seventh, which is the longest: from this to the eighteenth they become shorter, narrower, and rounder. The eighteenth (and sometimes the seventeenth) rib has no tubercle, consequently no articulation with a transverse process.

The cartilages of the first seven ribs proceed and are immediately attached to the sternum, from which circumstance they have been designated the *true* ribs; the cartilages of the remaining eleven are only connected to one other, hence are denominated *false* ribs; they still participate in the motions of the breast bone however, through the medium of that of the last true rib. When the number of ribs exceeds thirty-six, the eighth and sometimes the ninth are true—*i.e.* their cartilages are continued to the sternum.

The chest is of a conical form, the apex of the cone being turned forwards; a shape given to it in consequence of the greater length and curvature of the posterior ribs; its area consequently is much greater behind than before. The circumferent outline of the chest differs but little in figure from that of a circle, at least in well formed animals; there are horses, however, in which it approaches more to an elliptical shape, from insufficient bow in the bodies of the ribs: such are called *flat-sided*. But it does not of necessity follow, that because a horse's chest is not round, it must be badly constructed; for if there be great length from the withers to the sternum, the deficiency in circularity is in a great measure supplied by the depth. Speaking generally however, that animal is best formed (more especially if it be of a kind selected for food) whose chest exteriorly presents the nearest outline to a circle: it will preserve

its condition under less favorable circumstances, and will, in fact, exist where one with an oppositely formed thorax would probably starve. On the other hand, circularity of the chest is, and more particularly in horses, always attended with a diminution of speed, in consequence of removing the scapulæ far apart, and giving that conformation to the shoulders expressed by the term, "thick-shouldered." Both these facts are strikingly illustrated in the bull-dog and the greyhound: the former, comparatively slow and aukward in progression, but celebrated for strength, requires but little food to be kept fat; the latter, the fleetest of the kind, by his lean and delicate make shows himself unable to contend with so robust an adversary. We shall enter more at large into this subject in another part of the course.

The ribs are occasionally broken. We have not met with a case of this kind; but should such an accident occur, the principal part of the treatment would consist in applying a broad roller around the chest, in order to impede the motion of the fractured parts: we have several ribs now before us which exhibit traces of much bungling in the management of these cases. Sometimes from blows, hard round lumps, either callous, or bony, make their appearance upon the ribs; which now and then go on to suppurate, and produce troublesome abscesses upon the side: in these cases, there is commonly some pieces of dead bone to be cast off before the wound be allowed to heal. In some instances we see the heads of the ribs immoveably fixed within their vertebral sockets by anchylosis.

On the Bones of the Fore Extremity.

Though this part corresponds to the upper extremity

of the human subject, on which account the names of the different bones composing it, have (like those of they bones already described) been borrowed from the nomenclature made use of by anatomists of the human body; we are far from giving assent to such an unwarrantable liberty, or wishing to countenance such perversion of language. At the same time, so averse are we to the introduction of *new* names, that, with the exception of one or two glaring misnomers, we shall faithfully adhere to the established veterinary vocabulary.

There are some bones of the fore extremity never spoken of, even by professional men, but by the vulgar (or farrier's) appellations—such are the pastern and coffin bones; while others, remarkable enough, are seldom or ever heard of but in Latin—as the scapula, os humeri, and radius. Now there is much inconsistency in all this: either let us have a Latin, or an English nomenclature; a medley is not only degrading to the science, but casts a slur upon the literary reputation of that individual who in matters of professional importance makes use of it.

Stubbs considered (and properly enough too in order to carry on a close comparison between the skeleton of a man and that of a horse) the pastern and coffin bones as phalanges; veterinary science however, attaches far more importance to them, than to regard them in so general a way as human anatomy does these last mentioned parts: indeed, they bear but little resemblance in structure, and less in use, to the bones of which our fingers and toes are composed.

In describing these parts, we always treat of them singly; it is necessary therefore to have separate Latin denominations for them. Those we have here adopted

may be found in Latin authors on subjects relating to the horse, and may serve—*dum meliora proveniunt.*

Scapula.

The scapula is a triangular bone obliquely placed against the side of the chest; having its coracoid process opposed to the sternal extremity of the 1st rib, its posterior angle to the curvature of the 7th, or 8th, and its superior elevated somewhat above the transverse process of the 4th or 5th dorsal vertebra *. The different parts of it worthy of notice are very distinctly marked, and easily retained in memory. It is broad and thin superiorly; narrow, but thick and strong, inferiorly. Its sides are called costæ, prefixing to each the epithet, *superior*, *anterior*, or *posterior*, according to its relative position in the skeleton: the superior costa in the recent subject is tipped with cartilage. Its angles are *superior*, *posterior*, and *inferior;* but the latter appears as if it had been in part cut off, and formed into an oval articular cavity, called the glenoid; which is adapted to the reception of the round and smooth head of the os humeri. From the fore and upper part of this cavity, extends a strong, rough protuberance, named the coracoid process. Its external surface—the dorsum, is unequally divided into two concavities by a central ridge of bone, denominated the spine; the lesser of them is placed anteriorly. Upon its internal part the bone is smooth, somewhat excavated, and marked by the attachment of muscles: to this the name of venter

* Stubbs, and many other delineators since his time, have represented the scapula out of its natural situation: they have placed it too high, and have not attended to that slope, or obliquity, which constitutes the beauty of this part in the living horse.

is given. It is roughened about the glenoid cavity by the insertion of the ligaments of the shoulder-joint.

The scapulæ are attached to the trunk solely by means of muscles—no joints intervene; so that the head, and neck, and half the carcass, are in reality suspended by the muscles which tie these bones to the sides of the ribs; for if they were cut through, those parts must necessarily fall to the ground.

The scapula possesses a degree of rotatory motion, on which the extent and facility of action of the fore limb mainly depends; so that whatever lessens its sphere of rotation, nearly in the same ratio limits the projection of the anterior extremity. And if it be ascertained that its motions are confined, for reasons we shall hereafter point out, in proportion as it approaches (in situ) to a line passing perpendicularly through the middle of the fore leg, we shall become practically acquainted with the mechanism of the shoulder, and know as much as the experienced horse-courser, who vainly piques himself in the possession of a knowledge, to a man of science he considers unattainable. When the scapulæ are perpendicularly placed, so that the superior costæ are directed towards the spines of the dorsal vertebræ, horses are said to be "thick shouldered," or more properly, "upright in their shoulders;" for, as we have already demonstrated, the *thick* shoulder may arise from a very different conformation; hence it is as is well known, that such animals are bad goers, exceedingly unpleasant to ride, not to say dangerous: the want of adequate freedom in the projection of the fore legs, destroys their concurrence of action with the hind, confusion in progression follows, and stumbling, if not falling, is the consequence. The scapulæ, therefore, should be *obliquely* placed; though even then the

shoulder may be thick; still it does not arise from so objectionable a disposition of parts, as what we have ju s been describing: on the contrary, there are some horsemen who prefer this kind of shoulder to a *thin* one.

The scapula sometimes exhibits morbid appearances about its lower extremity. Earthy concretions are now and then seen around its cervix, and upon the coracoid process; more commonly however, the edges of the glenoid cavity are much thickened by incrustations of new bone, and its articular surface presents that worm-eaten appearance which shows the destructive effects of long continued inflammation of the shoulder-joint.

Os Humeri.

It is somewhat remarkable that the os humeri of the horse, as well as that of the human subject, and, we believe, most quadrupeds, should have the appearance of having been twisted in its body. It is a short, but strong bone; and its description, like that of others of the cylindrical class, is much simplified by dividing it into a body, and two extremities. The upper extremity is formed principally by the head; a smooth, round, convex portion, which we observed, when speaking of the scapula, was received into the glenoid cavity; for which it is made disproportionately large, in order to admit of extensive motion. Anteriorly to the head are two projections, which we may call, the greater and lesser tubercles: the former, the outer one, terminates in a thick protuberant ridge. The body of the os humeri is smaller, but rounder, smoother, and more compact than the extremities. Its lower end presents a pulley-like articulatory surface, formed of three smooth eminences, with concavities between them, which are fitted to corresponding depressions and pro-

minences upon the head of the radius. Posteriorly, at this part, there are two unequal projections, called condyles, with a deep hollow between them for the reception of the olecranon of the ulna; whereby the arm admits of being carried backwards beyond the line of complete extension.

The motions of this bone are simultaneous and concurrent with those of the scapula: they are not confined to simple flexion and extension, but are in some measure of a rotatory kind, so that a horse has the power, to a certain extent, of turning the toe in or out. Its chief movements being downwards and forwards, they will be greater according as it inclines to a right angle with the scapula: here again then we perceive the advantage of having the scapula in an oblique position.

The os humeri is seldom diseased but at its upper end; its head often shews marks of caries, from disease of the joint. It is sometimes seen encased with new bone, so that its body is twice or thrice the natural size. We have one preparation of fracture of it, in which union of the broken ends has taken place without any material shortening: it is however by no means a specimen of *good* surgery.

Radius et Ulna.

THOUGH these bones are commonly treated of separately, in consequence of their union being of a cartilaginous nature in the colt, we ought not to regard them as such in the adult horse: we meet with but few instances in which we can disunite them by maceration or boiling after five years old, in consequence of the conversion of the original connecting cartilage into bone.

The radius may be said to be the *os brachii* of the horse; indeed there would be no great impropriety in

considering both the ulna and it under this name. It is of a cylindrical shape, flattened and expanded at either extremity. Its head presents an articular surface, corresponding to the pulley-like one of the condyles of the humerus, upon which the latter have free hinge-like motion. The body of this bone is bent forwards, and so far resembles that of the os femoris of the human subject: it is convex and smooth upon its fore part, concave and hollowed out posteriorly. At the lower extremity we find three superficial depressions for articulation, the external of which is the smallest, adapted to the upper surfaces of the bones of the first row of the knee, upon which the radius rests. In the recent subject, this bone is invested with muscles, insomuch that no knowledge of its exterior form can be obtained by examination of the arm.

The ulna is chiefly remarkable for its protuberance above the radius, which part is called the olecranon, in conformity to a process of the same name extending from this bone in the human subject, which forms the elbow: and indeed, whimsically enough, this part in horses is designated the *elbow*, though from it to the knee constitutes the *arm*. The extremity of the olecranon gives insertion to a powerful muscle of the shoulder, called the triceps extensor *brachii;* a muscle that not only aids in progression, but one that is also employed in preserving the standing posture: for these reasons, it is a point worth attending to in the construction of this part, as connected with speed and strength, that the elbow be long and projecting, and thereby afford a more powerful lever in the extension of the arm. In front the olecranon is scooped out and smooth, which part of it enters into the composition of the elbow-joint, by articulating with the os humeri.

Os Scaphoides.

The os scaphoides, situated on the inner side of the knee, is the largest bone of the superior row. Above, it articulates with the innermost depression upon the lower end of the radius; below, with the ossa trapezoides et magnum; laterally, with the os lunare. It supports a greater proportion of the weight of the body than either of its fellows in the upper tier.

Os Lunare,

Central bone of the first rank, is smaller than the last described, and of a wedge-like shape. It articulates above with the middle depression upon the radius; inferiorly with the ossa magnum et unciforme; laterally and internally, with the os scaphoides; laterally and externally, with the os cuneiforme.

Os Cuneiforme

Is the smallest bone of the upper tier, to the outer side of which it is placed, a little more backward than the others. It receives the innermost articulatory surface of the radius superiorly; below, it is supported by the os unciforme; laterally, it is united to the os lunare; and behind, it is articulated with the os trapezium.

Os Trapezium,

According to Stubbs and his followers, os pisiforme —is of quadrilateral figure, and is so placed at the back of

found that both of them differ in relative situation and use from the bones of the same name in the human wrist, is to us perversion of language to no useful end. To remedy the abuse with as little innovation as possible, we have merely transposed these names.

LECTURE XIX.

Carpus.

IT is with a full conviction of the inapplicability of the above term, that we commence our description of this part of the skeleton: with the hope, however, of rendering a knowledge of the osteology of the horse easy of attainment to the surgeon, we continue in the use of it, and of some others equally inappropriate. With this remark, which we trust will cast off the imputation of consciously persevering in error, we proceed with our anatomical inquiries.

The carpus, wrist of the human subject, knee of the horse, is composed of eight bones, arranged in two rows. The upper row, beginning from the inside of the knee, consists of the ossa scaphoides, lunare, cuneiforme, *trapezium**; the second, of the ossa *pisiforme*, trapezoides, magnum, unciforme.

* Willing as we are to observe a close adherence to the nomenclature of human anatomy, in this instance, the incongruity is such that we cannot proceed without some alteration. To name a bone of the size and precise shape of a pea a *trapezium*, and another of a quadrilateral figure *pisiforme*, when we have already shrunk from calling the pastern and coffin bones phalanges, and

Os Scaphoides.

THE os scaphoides, situated on the inner side of the knee, is the largest bone of the superior row. Above, it articulates with the innermost depression upon the lower end of the radius; below, with the ossa trapezoides et magnum; laterally, with the os lunare. It supports a greater proportion of the weight of the body than either of its fellows in the upper tier.

Os Lunare,

CENTRAL bone of the first rank, is smaller than the last described, and of a wedge-like shape. It articulates above with the middle depression upon the radius; inferiorly with the ossa magnum et unciforme; laterally and internally, with the os scaphoides; laterally and externally, with the os cuneiforme.

Os Cuneiforme

Is the smallest bone of the upper tier, to the outer side of which it is placed, a little more backward than the others. It receives the innermost articulatory surface of the radius superiorly; below, it is supported by the os unciforme; laterally, it is united to the os lunare; and behind, it is articulated with the os trapezium.

Os Trapezium,

ACCORDING to STUBBS and his followers, os pisiforme—is of quadrilateral figure, and is so placed at the back of

found that both of them differ in relative situation and use from the bones of the same name in the human wrist, is to us perversion of language to no useful end. To remedy the abuse with as little innovation as possible, we have merely transposed these names.

the others as not to be visible from an anterior view of the carpus. This bone, from its situation, does not partake of the support of the body: it bears no more weight than a spur affixed to our heel. It is articulated with the posterior part of the os cuneiforme, to which, and to the os lunare, it is connected by strong and short ligaments. Its chief use is that of furnishing a lever, on which the flexor muscles are enabled to act with considerably additional force in bending the leg. It also serves for the attachment of the posterior annular ligament of the knee.

Os Trapezoides

Is the smallest bone of the inferior row, situated at the inner and back part of it. It is united above with the inner part of the os scaphoides; beneath, it articulates principally with the internal metacarpal bone—only a small portion of it pressing upon the large; more anteriorly than laterally, it is connected with the os magnum. What portion of the weight this small bone sustains, it transmits almost wholly to the internal metacarpal bone: which fact we shall have occasion to advert to at another time.

Os Magnum,

Properly so named from being the largest of these bones, occupies the greater part of the articulatory surface of the head of the os metacarpi magnum, upon which it rests. Above, it supports the ossa scaphoides et lunare, having the ossa trapezoides et unciforme at its sides. This bone, though considerably broader, is not so thick as most of the others.

Os Unciforme,

The outermost bone of the last row, is united firmly

to the os magnum. Below, it is resting upon the os metacarpi externum; it is also in part supported by the os metacarpi magnum. Superiorly its principal articulation is with the os cuneiforme; it is however in part impressed by the os lunare.

Os Pisiforme.

The true pea-shaped or orbicular bone. A little round bone situated entirely out of the line of force from above; being placed behind the os trapezoides, with which alone it articulates. Its use is not very apparent.

The knee in the skeleton is somewhat arched, owing to the broadest parts of the carpal bones being turned forwards. These bones are covered by cartilage, strongly connected to each other by numerous ligaments, and form so many separate joints.

The knee, though not so common a seat of disease as the hock, is more subject than it to external injury; and the worst cases of this description are those of open-joint. We have lately had a case of punctured knee-joint, which, from mal-treatment in the first instance, was followed by death. On examination of the part, we found that many of the small bones were rough and jagged upon their surfaces, in consequence of having lost their articular cartilages from ulceration; and some bony accretions around their edges had commenced anchylosis, a state in which all such cases terminate.

Bones of the Leg.

These may be said to be the same, both in number and kind, in the hind and fore extremities; the only material difference between them is in their dimensions, which of course vary according to the general conforma-

tion of the limbs themselves. Indeed, in this respect, these bones may be considered as somewhat dissimilar in horses of different breeds: some, we know, have long cannons and pasterns; others, on the contrary, are remarkable for the shortness and (apparently) greater compactness of these parts. That part of the leg commonly known as the cannon, but which, according to our present nomenclature, is technically called the metacarpus, consists of three bones:—the os metacarpi magnum, et ossa metacarpi parva.

Os Metacarpi Magnum.

The large metacarpal, cannon, or shank bone, is placed between the knee and fetlock-joint. It is of a cylindrical form, rounded before and somewhat flattened behind. Its upper extremity, or head, is modelled to that of the os magnum of the knee, which is resting upon it, and covers nearly the whole of its articulatory surface. There are two small depressions upon its outer part, one before the other, for the articulation of a part of the os unciforme; another still smaller upon its inner and posterior part, which receives an equally small portion of the os trapezoides: they all form inclined planes towards the small metacarpals, from which circumstance the latter are receiving the principal part of the weight transmitted by those bones. The large metacarpal is a remarkably straight bone, very superficially placed in the recent subject, being only in some places covered by skin. Its lower extremity bears no resemblance to the upper—it is shaped like a trochlea, or pulley, and exhibits by its articulation with the next bone a good instance of the hinge-like joint. It is formed into three convexities, the central of which, the most prominent, is divided from the others by two superficial, broad

concavities: they are all adapted to correspondent rotundities and excavations upon the upper end of the large pastern-bone. By this kind of construction all lateral motion is prevented, but flexion and extension freely admitted of; had the structure of these parts been such as would have given motion from side to side, a tendency to dislocation must have resulted, and a considerable diminution of actual strength. This joint is closed behind, and rendered more secure, by the sesamoid bones, which are in contact with the posterior and lower end of the cannon, and much enlarge the surface of articulation; whereby a still greater range of motion is obtained.

Ossa Metacarpi Parva.

The ossa metacarpi parva, or splint-bones, two in number, distinguished by the epithets *internum* et *externum*, are placed on either side of the os metacarpi magnum. A small portion of the upper part of each bone is only visible from an anterior view: from inclination to the back of the cannon, they are only seen, in full, from behind. They vary somewhat in length in different horses, but generally extend more than two-thirds of the large bone downwards; and the inner is frequently somewhat longer than the outer. They are of a pyramidal figure. The head is the largest part, and has upon it an articulatory surface; the lower end, which is tapering, is terminated by a small rounded knob. The os metacarpi externum supports, in part, the os unciforme; the os metacarpi internum, almost wholly, the os trapezoides; both however receive additional weight, in consequence of the lateral articulatory planes upon the large metacarpal bone being sloped towards them.

In order to convey a knowledge of the use of these

bones, it will be proper to premise, that they are closely and firmly connected, throughout their whole length, with the large metacarpal bone by a cartilago-ligamentous substance—by an elastic material of the same texture as that which attaches the ulna to the radius. Their situation in the skeleton demonstrates, that they in part support the weight of the body; and their mode of connexion leads us to believe, that they are in some small degree depressed by it. The share of the burden they sustain is received by the ligament connecting them, (for they articulate with no bones below,) the fibres of which are put on the stretch by its sudden impression; and this momentary extension is followed up by instantaneous contraction, the effect of the reaction of these elastic fibres. That these bones move therefore, there can be little doubt; but it seems to us, that the word *descend* is unhappily chosen to express that which is the result of instantaneous impulsion upon a body simply having sufficient elasticity to counteract the effects of concussion. Before we proceed to a description of the bones below, it will be necessary to consider the

Diseases of the Metacarpal Bones.

These bones are not unfrequently broken from a variety of causes. Though we have seen accidents of this nature, we have never had an opportunity of treating one: we are informed however by Mr. Bass, a respectable practitioner near Barnet, who has had many of these cases under his care, that by the proper application of splints and bandages, an union may be generally effected, without slinging, or even narrowly confining the animal. The only case of the kind we ever saw treated, was one that occurred during our pupilage at the Veterinary College;

and this had an unfortunate issue. The horse, we recollect, was slung; to which circumstance we now feel inclined to ascribe the failure.

We have two or three cannons whose bodies are so completely encased in a layer of new bone, that the splint-bones are altogether concealed in the adventitious mass. Exostoses, sometimes of very large size, grow from the cannon bone; they are more common near its upper than its lower extremity, and (with the exception of splints) are rarely met with upon the middle of the leg; where, we believe, they always originate from blows. The common and universally known disease of these parts, is

Splint.

A SPLINT—so called, says BRACKEN, because it serves to strengthen the bone as thin pieces of wood would —may be defined to be, an exostosis upon, generally the inside of, the leg. Though this is the definition commonly given of a splint, it but little elucidates its nature—it omits, what may be said to be, its essential character; for unless the elastic substance joining the small to the large metacarpal bone, partake of the disease, we, as professional men, should not call an exostosis, a splint; though, to the common observer, it may appear to be in the precise site of one. A splint, in truth, is an ossification of the cartilago-ligamentous substance uniting the small to the large metacarpal bone. Inflammation is first excited in it: in consequence of which, like other similar textures in the horse, disposed to ossification, it becomes a nidus for the deposition of bone; into which it is soon converted, in the same manner as cartilage undergoes that change in the young subject; so that there is no longer any natural separation of these parts—the whole is consolidated,

and forms but one and the same bone. If the disease stopped here, (and indeed it sometimes does,) we should never be able to detect a splint in the living horse; more commonly, however, in consequence of diseased action in the periosteal vessels, a circumscribed callous tumor is produced at the same time, which, like the callus effused from the fractured ends of bones, is only the bed for subsequent osseous deposition: and hence it is that splints become perceptible externally. Though the exostosis, therefore, be the medium of our information as to the condition of the parts underneath, it is by no means essential to the existence of splint; for in old horses, it not unfrequently happens that the whole of the adventitious deposit becomes absorbed; a fact which farriers and grooms explain, by saying, "that their splints *wear away*." But we know, that these animals are no more free from splints than they were before the tumors disappeared; for unless the original elastic texture of the uniting material of the metacarpal bones be restored, a process incompatible with the laws of the animal economy, a splint is never eradicated:—a splint never was, nor ever can be, radically cured—once a splint, always a splint.

There are two universally admitted facts that serve to point out the cause, as well as nature of this disease: *viz.* first, that splints are seldom found upon the outside of the leg; secondly, that horses throw them out soon after they are domesticated, or broken in. One and the same effect is produced in either of these cases—the preternatural extension of the uniting elastic medium we have so lately alluded to; in consequence of which, it takes on inflammation and ossification as before described. Why the inner small metacarpal bone should be so constantly

its seat, happens from its more centrical situation in the skeleton, where it receives a more forcible depression than the outer: in addition to which, as another evident reason, we may adduce the mechanism of the knee-joint; the innermost bones of which, in the lower row, are so arranged as to form independent joints with the inner metacarpals. Why horses recently introduced into the *manége* should more especially have them, is explained by saying, that their limbs are supporting weights, and made to perform divers rapid and unnatural actions, to which they have never been accustomed, and to sustain shocks too severe for their elastic powers to encounter at so tender an age without injury.

When on the spine, we submitted, that the changes of structure so frequently seen in it on dissection, must have tended much to diminish its natural springiness of motion; although this effect is not sufficiently manifest in all cases to lead us to suspect their existence during life. We may, with equal truth, apply this remark to the disease now before us; it being one of those that deprives the animal of its natural elasticity of movement, and, as such, may, and probably does in process of time, give rise to mischief in the joints in the vicinity, in consequence of their being shaken by that concussion which these parts, in their healthy condition, were designed to ward of.

Recent splints are sometimes accompanied with lameness; and this has been accounted for in two different ways: some referring it to interference with the motions of the flexor tendons, or with those of the knee-joint; others to preternatural extension of the periosteum. But splints are very rarely of sufficient magnitude to produce lameness from the first of these causes, and we are not much

inclined to place faith in the efficiency of the latter—one that has its origin in a theory respecting the mode in which pain is produced by nodes in the human subject; for the cases are widely different. A node is not essentially a bony tumor, but one that appears to have its origin in the periosteum, and sometimes suppurates: its cause is syphilitic, or probably mercurial; and the pain accompanying it is only occasional, and commonly nocturnal—but what has all this to do with splint? Without entering again* into a controversy about what appears to us to be the upstart of false analogy, followed by hasty conclusions, we would observe, that inflammation, especially if it be acute, in ligamentous structure, is always productive of extreme pain in the human subject, and that this, of itself, in our opinion, is at all times fully adequate to the production of lameness, however severe, in the horse. In support of this, we may offer, that the lameness is not proportionate to the size of the splint, nor to its rapidity of formation: on the contrary, the tenderness is often extreme, and the action as imperfect, when the splint is of comparatively small size.

In regard to the treatment of splints, it is not necessary to be prolix in what we have to offer, or to take up time with an account of remedies of doubtful efficacy, when we have one at our elbow that will fulfil our utmost wishes. By the cure of a splint is vulgarly understood its removal; but we should on most occasions content ourselves with the subsidence of the lameness; and with this view, the practice—old as it is!—of repeatedly blistering the part is the best we know of:—rest, and a blister, or two, will almost always succeed. But we are often called on to *re-*

* Vide Lecture XV. *On Exostosis.*

move splints; and simply because they are deemed eye-sores, though in reality they are seldom perceptible but by the feel. When blisters are not active enough for this purpose, we *fire;* but we seldom have occasion to do so. Still, let it be remembered, that no splint, in truth, can be cured—the parts converted cannot be restored to their natural pristine condition; so that its effects alone—pain and tumor, come within the power of remedy. But as the tumor itself is of no consideration, and lameness is only an occasional symptom, many of these cases require no treatment: and it is ever injudicious to meddle with them unless they *are* accompanied with lameness.

To the operation of dividing the periosteum in splints, we are not only theoretically, but practically adverse; inasmuch as we believe that the lameness can, in all cases, be relieved by much simpler means. It is not enough that a remedy be *new;* it should have proved itself *better* than the old, before the latter be relinquished.

As to the removal of splints by an operation, or the destruction of them by caustic, they are both troublesome and dangerous modes of practice; and as such have been very properly discontinued in all ordinary cases of this description*.

* Gibson, one of the best old authors on this subject, describes a varicose condition of the veins, as an effect of splint: we do not recollect to have seen a case of this kind. After shewing how the cautery is to be used for this, the cure of which, he says, "is often doubtful;" he adds, "nevertheless, I should, in the first place, prefer *mild blisters often repeated,* as recommended in the cure of bone-spavin, which I have found to answer beyond expectation, and without the hazard of any ill accident, or any remarkable disfigurement." Gibson's *Treatise on the Diseases of Horses. Vol. II.*

LECTURE XX.

*Os Suffraginis**.

THE os suffraginis, or large pastern-bone, is situated between the fetlock and pastern joints, and is somewhat of a cylindrical figure. Its upper extremity, which is larger than the lower, has three concavities—a central deep, and two lateral superficial, adapted to the convexities upon the lower end of the os metacarpi magnum. Posteriorly, the head is hollowed out; to which part the ossa sesamoidea are firmly attached by ligament. Its body becomes smaller and rounder below, and terminates in a somewhat expanded extremity, having two smooth rotundities divided by a superficial hollow: these articulate with the upper part of the small pastern-bone, and form the pastern-joint. At the back part of the body of this bone is a rough triangular surface, into which the short ligament of the sesamoids is inserted.

The pastern-joint, like the fetlock, admits only of flexion and extension.

* The Latin word *suffrago* is sometimes used for the hock, as well as the pastern. We confine its signification here to the last: having the word *tarsus* to denote the first.

Ossa Sesamoidea.

The sesamoid bones, two in number, of a cuneiform or wedge-like shape, are placed at the back of the fetlock-joint, with their apices turned upwards, and their bases downwards. Each has three sides, a base, and an apex. They present triangular, excavated, articulatory faces anteriorly, which enlarge considerably the surface of articulation for the lower head of the large metacarpal bone. Their inner edges, when united, form a groove for the reception of the middle eminence of that bone. The posterior parts are obtuse, and roughened by the attachment of the suspensory ligament. Their bases afford insertion to short and strong ligaments, which connect them to the large pastern-bone. Posteriorly they are smooth, and rather convex, and leave a hollow between them, when joined together, which in the recent subject is lined with cartilage, and receives the flexor tendons in their passage to the foot. At this part is a large bursa mucosa, within which these tendons play.

Here we have another instance of the weight being conveyed to bones, themselves without any bony support; an admirable construction, not only to diminish force, but to guard against the concussion which its sudden impression upon the parts below, had they alone borne the burden—without some diversion of this kind—must have been productive of. That we may perfectly understand the motion of these bones, it will be necessary to state, that they are chiefly retained in their situation at the back of the pastern-joint by an elastic ligament, which connects them to the large metacarpal bone, and that the flexor tendons embrace them in their course down the leg, so closely, that they also materially assist in their confine-

ment. It is said, that "these bones *descend* at every step the horse takes." This is not altogether correct; for their inferior edges adhere so closely to the pastern-bone, through the medium of short *inelastic* ligaments, that, as far as regard these parts, they can have no such motion. It is, in fact, by this mode of union, that the sesamoids are so well adapted for the purpose for which they are designed: had the lower as well as the upper parts of them *descended*, then must the operation of this beautiful piece of mechanism have been comparatively inefficient. The inelastic connexions they have below, serve as a hinge upon which they move; for every time they receive the impulsive force, *the sesamoids spring backwards and downwards, in such a manner, that their apices describe the segment of a circle, while the lower simply turn upon their own axes**. Their relative position, their connexion, and the manner in which weight is imposed upon them, all demonstrate to us, that such is the motion—can we correctly speaking call it *descent?*—that these bones undergo. No sooner are the sesamoids set at liberty again, which instantaneously follows their sudden and forcible depression, than by the combined reaction of the suspensory ligament and flexor muscles, they, with a resilient motion, regain their places. Thus are the fetlocks of horses furnished with springs (if we

* Professor COLEMAN (page 24, vol. II. of his work on the foot) expresses this as follows:—"In consequence of forming the back part of the large pastern-joint, and articulating with the lower and posterior part of the cannon; they contribute very essentially, *by always receding whenever the foot comes in contact with the ground*, to act as a spring to the animal, and to prevent concussion." And the word *recession* is certainly preferable to *descent;* but by neither is implied the *modus agendi.*

may so designate them) by means of which the machine is transported from place to place, with grace, and ease, and elasticity of movement. The operation of these parts is extremely well seen, by observing the fetlocks of such horses as are remarkable for graceful and elegant action: such are the Arabian and Sicilian breeds, in which we may not unfrequently perceive, that the tufts of hair growing from the fetlocks, sweep the ground, at every bound made in the canter, although they be elevated several inches from it in the standing posture. From what has been said, it will readily be seen, that the quantum of weight thrown upon the sesamoids will be greater or less, according as the angle formed between the cannon and pastern is less or more obtuse: as it approaches to the right angle, the seamoids being more under the centre of gravity, more impressed, so are their elastic connexions put more on the stretch, and the spring is proportionably the greater. Hence it is, that arabians, sicilians, and our thorough-breds, whose pasterns are oblique and long, (for these are inseparable properties,) have an elasticity in their gait, which cart-horses and heavy hacks, with short and upright pasterns, are not endowed with: indeed, many of the latter, from the total absence of such qualities, are knowingly called *bonesetters*. Why the fetlocks of different horses should vary thus far in their construction, is a query not difficult of solution, when we reflect on the uses of (what may be called) these animal springs. If concussion be the effect of the suddenness and rapidity of movement, with which the machine is propelled, and these springs be set to ward it off, how little can they be required in the pasterns of the cart-horse, when compared with the arabian and racer? The gallop, or canter, which is nothing more than a suc-

cession of leaps, is the pace in which those springy parts are most called into action; but it is one that the cart-horse, and stiff and upright cob, appear never to have been designed for.

Furthermore, it seems to us, that these elastic parts assist in the elevation of the feet from the ground, in those paces in which they are called into sudden and forcible action. The suspensory ligament by its reaction, instantaneously after extension, we feel inclined to believe, *aids the flexor muscles in bending the pastern-joints:* the astonishing activity and expedition displayed in the movements of the race-horse, at speed, seem to be referable, in part, to the promptitude with which the suspensory ligament can act before the flexor muscles are duly prepared; the latter, we should say, *catch,* as it were, and then direct the limb, first snatched from the ground by the powers of elasticity.

Os Coronæ.

THE os coronæ, small pastern, or coronet-bone, though of smaller dimensions than the large, bears much resemblance to it in appearance. It is not half the length of the former, but of greater proportionate breadth, being of a quadrangular shape. It has but two, and them superficial concavities upon its upper part; which articulate with the convexities upon the lower end of the large pastern-bone. This joint, admitting only of limited flexion and extension, is rendered somewhat more secure by a prominent ridge around the articulatory surface of the os coronæ, and by little eminences in the centre, both before and behind. The bone is somewhat contracted in its body, and is smaller below than above: indeed the inferior extremity is nearly allied in appearance to the lower end of the os suffraginis, but presents behind a more extensive

articulatory surface, which part is opposed to the navicular bone.

Diseases of the Pastern-bones.

We have several specimens of fracture of these bones. In one, the os suffraginis is broken directly across the articulatory surface upon its upper part: others exhibit fractures of the os coronæ. These fractures however, are all longitudinal or oblique; there is no instance of a transverse fracture in either the large or small pastern: and the number of the latter broken, exceeds much that of the former.

To point out the varieties of form and size which exostosis acquires in these parts, would far exceed our present limits; we shall, therefore, content ourselves with offering such general observations as seem to apply to the more common cases of this description. The soft parts about the fetlock-joint not unfrequently take on ossification; so that the articular ends of the bones composing it, become incrusted with a deposition of earthy matter, which may, or may not, interfere with its motions: and to such an extent does this bony change occasionally pervade the ligamentous and tendinous structures hereabout, that complete anchylosis of the fetlock is the consequence; of which we have a beautiful preparation now upon the table.

By far the most common seats of this disease however, are the pastern and coffin joints. From a minute inspection of about one hundred and fifty specimens of anchylosis of these joints, now before us, we submit the following summary detail:—

Five of complete anchylosis of the fetlock-joint.

Forty of complete anchylosis of the pastern-joint.

Eighteen of complete anchylosis of the coffin-joint; of

them there are only four in which the navicular joint does not participate.

Seven of complete anchylosis both of the pastern and coffin joints.

The others are all either simply incrusted, more especially their extremities, with layers of new bone, or variously deformed by exostoses of different shapes; many of which are of very large size; and several confined to one side. Upon one of the large pasterns, a complete bony ring is formed, in consequence of ossification of the theca of the flexor tendons. In almost all, the disease appears to have spread from the pastern-joint; for there are but few specimens in which some accretion is not seen around the lower extremity of the os suffraginis, and the upper one of the os coronæ; and it is this kind of deposition that gives rise to the disease called

Ringbone.

A RINGBONE may be said to be, an exostosis upon one, or both, of the pastern-bones. We see it more commonly in the hind than in the fore leg. It is asserted, that the seat of ringbone is the middle of the os coronæ: but those who entertain such an opinion, would find it as difficult to explain its origin, as to prove its existence in such a situation, exclusive of any connexion with the pastern, or coffin joint. We believe that ringbone, like splint or spavin, is essentially a disease of ligamentous structure; and not of periosteal origin, as most old writers would lead us to conclude. Inflammation is first excited in the ligaments of the pastern-joint, which terminates in the deposition of callus—afterwards bone—around the edges of one, or both pastern-bones; and this may, and frequently does, spread upon the body of

the os coronæ, or upon that of the os suffraginis: still, we contend, the disease has its origin in the ligaments of the pastern-joint.

The causes of ringbone are acts of violence to these parts:—overweighting the animal, or requiring exertions of him his powers are unequal to; hence young horses when first backed, are very liable to have them. Why the disease should be more frequent in the hind legs than in the fore, is simply owing to their vehement action in progression: for we apprehend that ringbone is not so often the product of concussion, as the effect of severe sprain, extension, or perhaps rupture, of ligamentous fibre. Some say, that "blows produce ringbones:" undoubtedly a blow upon the os coronæ would very probably, be followed by exostosis, and so would one upon the head, or hip; but the pastern is not a very likely part to be often struck.

Ringbones may be accompanied by lameness, or not, depending on the presence of inflammation, and the degree of it, and on their size and situation, so far as they may impede the motions of the joint: in the last case the lameness is generally permanent.

If the horse be lame, and the cause of lameness be inflammation present, we first ought to make use of means to abate this increased action; and could we take blood from the part itself, none would prove of greater benefit. After this, repeated blisters, or blisters kept open, are alone to be depended on. Unless absorption of it be our object, and then the actual cautery may promote it*.

Os Naviculare.

THE navicular, sometimes called the shuttle-bone, is

* Vide Lecture XV. *Treatment of Exostosis.*

somewhat of the figure of a half-moon: it is placed obliquely at the back of the coffin-joint, with its convex part downwards. Superiorly, it has an articulatory surface divided by a small eminence into two parts; where it is opposed to the os coronæ: anteriorly its edge is smoothed off, where it lies in contact with the coffin-bone; and thus much of it enters into the composition of the coffin-joint. Over the inferior part, where the bone is smooth, and has a tubercle upon its centre, the tendon of the flexor perforans passes, and entirely conceals it: by an indentation upon its inner surface, the tendon accommodates itself to the bone, and a large bursa is here interposed.

The navicular is closely connected to the coffin and small pastern bones by ligaments, which are short, strong, and inelastic.

From the os naviculare being articulated in part with the small pastern-bone, it will necessarily receive a proportion of the weight; and this weight is transmitted partly to its ligaments, and partly to the flexor tendon. The former being inelastic, cannot elongate; the latter, though in itself inelastic, being attached to muscle, will admit of extension. It is evident therefore, that the os naviculare does not remain steadfast during the action of these parts; on the contrary, it is moveable by the sudden impression of the os coronæ. It appears to us, that the edge opposed and connected to the coffin-bone, is simply the axis upon which the other part turns; so that limited *rotation*, rather than *descent*, conveys a *correct* idea of its motion*.

* In the lectures on the physiology of the different parts of the foot, we shall draw attention to some points relative to the use of this bone, which would seem to have escaped observation.

*Os Pedis**.

The os pedis, or coffin-bone, corresponds in shape to the hoof of the animal from which it is taken, as is seen by comparing those of the horse, ass, and ox together. We shall divide it, for the sake of facilitating description, into its *body*, and *alæ* or *wings*. The first comprehends the broad, solid part of the bone; the latter, its two sides, or ends, which extend backwards, and are placed posteriorly to its articulatory surface. The body is of a conical form; but the apex of the cone appears to have been cut off; at which part the bone is smooth, and excavated into two superficial depressions, for the reception of two corresponding eminences upon the lower part of the os coronæ. The inferior part of the os pedis is unequally divided into two concavities: the anterior one, the larger of the two, is very superficial, and in the recent subject is covered by the sensible sole; the posterior, situated between the two alæ, is deeper, and affords a surface of implantation for the tendon of the musculus perforans. Above this hollow is a narrow articulatory surface, extending between the two alæ, to which the os naviculare is fitted by one of correspondent figure and dimensions. The alæ proceed from the upper and back parts of the bone, and terminate in protuberant rough edges, to which the lateral cartilages firmly adhere.

There are several foramina in the coffin-bone. One through each ala gives passage to branches of the coffin arteries to the front of the foot; and two in the posterior concavity, through which the coffin arteries themselves

* *Pes* being the Latin word for the *foot*, not only of a man, but of any other animal, we have adopted it here as the most significant and familiar term we know of.

run. Several large foramina, and innumerable smaller ones, are seen in its front and sides, which transmit small vessels and nerves to the laminæ. There are generally about thirteen holes, more distinct than the others, around its lower edge.

The coffin-bone is of a porous spongy composition, and not possessed of much mechanical strength; of itself a strong argument to shew, that it was never intended, in an insulated condition, to bear the superincumbent weight. As we shall demonstrate in future lectures, this bone is attached to the hoof by an elastic substance, of a ligamentous nature, by which it is suspended in such a manner, that the crust, or wall of the hoof, is actually the part that sustains the weight of the carcass: were it not for this beautiful piece of animal mechanism, the ossa pedis must be fractured—nay, comminuted, the very first plunge the animal made: as indeed occasionally happens when disease has destroyed this much admired structure.

The front and sides of the os pedis, so much resembling the wall of the hoof, present inclined planes of various degrees of obliquity and depth, from the upper part to the basis. Anteriorly the breadth of this part is much increased by a semilunar bony eminence—the coronal process—which adds much to the security of the coffin-joint, and gives insertion to the tendon of the extensor muscle, whose action it in some measure assists. The coffin-joint, being of hinge-like construction, has no other motions than those of flexion and extension.

Diseases of the Navicular and Coffin-bones.

We have heard of several instances of fracture of the os pedis; though none have hitherto come under our immediate notice: and these cases, we believe, have been

more frequent since the operation of neurotomy has been practised. We should imagine, that this accident can only happen to such horses as have had much previous disease in the foot, from the continuance of which the contained parts have been impaired in structure. We do not recollect hearing of, much more seeing, a case of fractured navicular bone. Perhaps no bone in the body is more liable to disease than the os pedis; a fact we are not to feel surprised at, when we consider its intimate connexion with the hoof, and reflect on the changes the latter is continually exposed to, from the whims and caprices of those engaged in devising new and ridiculous forms of horseshoes. Of about a hundred morbid coffin-bones, we find, by far the greater number to have bony accretions upon their sides, having the shape and situation of the lateral cartilages: in upwards of half of them, the laminæ are, either partially or wholly, converted into bony ridges; twenty of them are morbidly small and upright, in consequence of absorption of the toe; in six of them the wall is deficient, and nothing is left but a small part of the sole, and the articulatory surface; in two others, nought remains but the articulatory surface—wall, sole, and alæ, have all disappeared from the destructive effects of mal-treated disease; in thirty the coronal process, as well as the edge on either side of it, have received considerable increase from earthy incrustion—the projection is, in several, many times its natural size, and the coronary ligament appears to be wholly converted into bone; in one or two the deformity is so great, that we can scarcely trace the characters of the original bone.

Where there is much disease of the coffin-bone, the navicular seldom escapes: it is sometimes found, in cases

of exostosis, so wedged in with the general mass of new-formed bone, that we are unable to extract it even after maceration. The lower articulatory surface of this bone not uncommonly appears as if it had been worm-eaten; which is nothing more than the effect of ulcerative action, that has its beginning in the bursa, between it and the tendon: the sequel of articular disease induced by precisely the same causes as give rise to it in other parts *.

* Vide Lecture XVI. *on the Diseases of Joints.*

LECTURE XXI.

The Bones of the Hind Extremity.

THESE do not differ much in number, nor in general arrangement, from the bones of the fore extremity: for example, the quarter, like the shoulder, is composed of two bones; the thigh, like the arm, of two; and the hock, corresponding to the knee, of many small ones. With regard to the bones of the pastern and foot, so great is their similarity in the hind and fore extremities, that it is often difficult to say to which they belong: for this reason one description suffices for both.

Os Femoris.

THE os femoris is the largest, thickest, and strongest bone in the body. Though so called from being conformably situated in the skeleton to the bone of the same name in that of the human subject, it is not, in reality, the bone of the thigh in quadrupeds: in them it forms what is called the haunch. Its upper extremity presents a smooth, round head, turned inwards, and marked by a small uneven depression upon its inner part, to which is affixed the round ligament of the hip-joint. A strong,

irregular protuberance of considerable size, juts out externally to the head, called the trochanter major externus. Below this projection is a smooth ridge of bone, interrupted in its course about the centre by a small eminence, whose extremity is crooked forwards: this is denominated the trochanter minor externus. A little below the head, but placed more backward than it, is a rough lengthened process, named the trochanter internus. The body of this bone is broad and flat above, round and smooth about its middle, and polished upon its anterior surface: it expands below, and terminates in two considerable prominences. Upon the fore part is a broad smooth articulatory hollow, sometimes called the trochlea, in which the patella is fitted, and plays with all the advantages of a pulley. The two smooth rounded eminences better seen posteriorly, named the condyles, move in two superficial hollows upon the head of the tibia; and between them the bone is roughened and porous, from the attachment of strong ligaments belonging to the stifle-joint.

The hip-joint, independently of flexion, extension, and some lateral motion, seems to possess, to a certain extent, the power of rotation.

We have only two preparations of morbid ossa femorum. In one, the condyles are encircled with a lip of adventitious bone, and present evident marks of disease having existed in the stifle-joint, in the asperity of their articulatory surfaces. The other is an admirable specimen of the cancellated structure of newly deposited bone, with which the whole of its body is thickly coated: indeed, from the softness and brittleness of its texture, it would lead to the belief, that the accretion was going on at the time of the animal's death.

Patella.

The patella, knee-pan of the human subject, stifle-bone of the horse, is of a quadrangular figure; convex, and exceedingly rough and porous, upon its exterior, into which part the tendons of the extensor muscles of the thigh are implanted; but irregularly concave upon its interior, where it presents two unequal articulatory surfaces, which fit it to the pulley-like convexities upon the anterior and lower part of the os femoris. The superior and lateral angles of this bone are more or less acute; the inferior, on the contrary, is obtuse and rounded off, and strongly marked by the attachment of the *ligament of the patella,* which connects it to the tibia.

The patella of the horse has been seen dislocated upon the outer condyle. Only one case of the kind has come within our observation; but Mr. Charles Percivall, veterinary surgeon to the 11th light dragoons, has met with two instances of it. The lameness occasioned by this accident is very considerable—the horse literally drags the limb after him; for, in consequence of the extensor muscles having lost their action, the pastern-joints are fixedly flexed to their utmost. In order to put the bone again into its place, an assistant should carry the limb forwards, so as to extend as much as possible the stifle-joint, while the veterinary surgeon depresses with the palm of his hand the outer angle of the patella: this gives the extensor muscles the power of drawing the bone into its proper situation, which they commonly do with a sudden snap. The most troublesome part of the management of these cases, is the prevention of another dislocation; for this very readily happens. We may rest the horse; but it is difficult to confine the limb. In one of the cases abovementioned, after repeated failures with

various contrivances, it was determined to fire the skin around the stifle, with a view of obtaining a more complete bandage than was possible by other means; and the expedient proved a very happy one.

Tibia et Fibula.

The tibia is the true *os femoris* of the quadruped. It is a strong compact bone, extending from the stifle to the hock, and is about the same length as the os femoris itself. Its upper extremity exceeds much in magnitude the lower, being broad and expanded: upon it are two articulatory surfaces, upon which the condyles of the os femoris rest; and these are separated from each other by a small irregular eminence, to which the crucial ligaments of the stifle-joint are firmly fixed. Posteriorly, at its upper part, the bone is hollowed out: anteriorly we find the tubercle, a projection serving for the attachment of the ligaments of the patella. The body of this bone is triangular in form, but the angles become gradually less distinct as we approach its lower end; where it is flatter, and somewhat broader than above. Here the tibia presents two deep *fossæ* or oval-like hollows, whose course is not direct, but oblique, from before backwards: they are separated from each other, and bounded on either side, by oblong eminences, roughened externally by the insertion of the ligaments of the hock-joint. The upper part of the astragalus, supporting the tibia, is so shapen, that a pulley-like articulation of great security and strength is formed by their apposition; and it is between these bones that the chief motions of the hock are performed; which, from the peculiar construction of the joint, are necessarily limited, at all times, to flexion and extension—no lateral movement whatever can take place. The principal advantages derivable from this dovetailed kind of union, are

great strength, and the utter impossibility of such an accident as dislocation, unless preceded by fracture.

To the outer part of the head of the tibia is fixed, by ligamentous and cartilaginous connexion, the fibula; a slender bone extended, like the string of a bow, along its body, and firmly attached again below its middle. In the adult horse, it is commonly but an apophysis.

We have two morbid specimens of this bone, showing the lower extremity somewhat enlarged from earthy concretion of considerable firmness. As the exostosis is chiefly confined to the inner side, we suppose that it, or a part of it, comes under the denomination of spavin.

On the Tarsus.

The tarsus—in human anatomy, the instep, in veterinary, the hock—is composed of six bones: *viz.* astragalus, os calcis, os cuboides, ossa cuneiformia, externum, medium, et internum.

Astragalus.

The astragalus, or knuckle-bone, is the strongest bone of the hock; being that upon which the tibia solely rests, and moves so securely by means of those deep excavations, or fossæ, in its lower extremity, which we, when on that bone, pointed out. The bold pulley-like eminences received by them, are extended in a semicircular direction over its upper extremity; and the smoothly scooped out fossa in the middle, is well adapted to embrace the central elevation at the lower end of the tibia: thus are these parts so locked together, that the hock, while it is admirably constructed to sustain great weight, and move with facility under it, is most ingeniously contrived to prevent all possibility of luxation. The astragalus inferiorly articulates with the os cuneiforme magnum, and

posteriorly with the os calcis by three surfaces of adaptation.

Os Calcis.

The os calcis—heel-bone, or hock-bone—is one that is very conspicuously situated in the living horse: it constitutes that part vulgarly called the *point* of the hock. It is so placed with respect to the other bones of the hock, that it receives but little of the superincumbent weight. By a broad irregular concavity, upon which there are three articulatory surfaces, it forms a like number of articulations with the posterior part of the astragalus. Inferiorly, it rests upon, and articulates with, the os cuboides. A considerable portion of this bone is made up of a projection extending backwards and upwards, called its tuberosity; the end of which is roughened for the attachment of muscle.

That pressure is imparted by the astragalus to this bone, appears to us indisputable, when we observe how the astragalus itself is impressed by the tibia: had that bone been placed perpendicularly, instead of obliquely, with regard to the hock, then would all the weight have been transmitted to the ossa cuneiformia; but, seeing that the direction of the force from the tibia is downwards, and at the same time backwards, surely it cannot admit of a doubt, that the os calcis receives a share of the superincumbent burden. Another proof that Nature designed this bone to assist in supporting the load imposed upon the astragalus, is the circumstance of its resting (and it is the *only* one that does) upon the os cuboides, which is supported below both by the os metatarsi externum, and by the os metatarsi magnum: so that if the os calcis were a mere process—not a supporting substance, the former of these bones could have no motion, conse-

quently no effect in diminishing concussion; nor would the latter be but partially impressed by the other bones of the hock; indeed the three bones we have just named would be comparatively useless. Notwithstanding these facts, it is affirmed, that the os calcis does *not* receive any portion of the superjacent load; "that it sustains no more weight than the spur upon our heel;" and that its whole and sole use is that of affording a lever for the operation of muscle. That it is a lever, and one of more or less power according to its length, has been long argued, and with much truth, by those who have reasoned analogically—comparing it to the os calcis of the human subject; hence we know, that broad and prominent hocks, are regarded as fine points in the general configuration of the animal. It must be remembered however, that these bones, though somewhat alike in shape, and the same in *name*, are very differently placed with regard to the limbs of these animals; and that the hock is a part which differs, in some essential points, in its construction from the instep. Considering these facts, it appears to us, that the os calcis may also serve to counteract concussion; though its operation will be very limited when compared with the action of what we have in another place designated an animal spring. Indeed, though the greater part of the weight thrown upon the hock be transmitted to the main bone of the leg, a certain proportion of it is expended in its ligamentous connexions, and of those of the small metatarsal bones. The uses of the os calcis, then, appear to be three in number:—to serve as a lever for the action of muscle; to bear a part of the incumbent weight; and to assist in preserving these parts from the effects of concussion.

Os Cuboides.

This bone is situated at the outer part of the hock,

and may be regarded as one of the *small* bones entering into its composition. It forms, as it were, a firm pedestal for the os calcis, to which it is firmly united above; while inferiorly it is opposed in part to the os metatarsi magnum, and by a smaller articulatory depression to the os metatarsi externum. Posteriorly it articulates with the ossa cuneiformia, magnum et medium. As the os cuboides has no connexion whatever with the astragalus, the weight transmitted to the outer part of the leg must be received from the os calcis *alone;* a fact of itself, as we had occasion just now to remark, that appears to carry conviction with it, in regard to the last named bone being a pillar of support to the parts above.

Os Cuneiforme Magnum.

THAT upon which the astragalus immediately rests; being wedged in, as its name implies, between it and the bone underneath—the os cuneiforme medium. This bone is somewhat concave above, and flat and smooth underneath, nearly the whole of its surface being articulatory. The under part shows three distinct articulations:—a large one anteriorly for the os cuneiforme medium; and two smaller posteriorly—one for the os cuboides, the other for the os cuneiforme parvum.

Os Cuneiforme Medium.

THIS bone (which has received the epithet of *medium* in regard to its size, and not its relative position) resembles in form the last described: it is however altogether smaller, and much narrower posteriorly. It articulates above principally with the os cuneiforme magnum; posteriorly with the os cuboides, (in such a manner as to be in some measure impressed by it,) and with the os cuneiforme parvum: below it rests flatly upon the os metatarsi

magnum, the greater part of whose upper surface it covers.

Os Cuneiforme Parvum.

This is the smallest bone of the hock; upon the inner and posterior part of which it is placed in such a manner that a portion of it overlaps a little the back of the other cuneiform bones. Superiorly it is articulated with a part of the os cuneiforme magnum; more posteriorly with the cuneiforme medium: from the former it receives a part of the weight, but with the latter it is only connected so as to be retained in its situation. Anteriorly it also articulates with the middle cuneiform. It is supported chiefly by the os metatarsi internum; for though a portion of it rests upon the head of the os metatarsi magnum, that bone is comparatively but little impressed by it.

Os Metatarsi Magnum.

This bone only differs from the os metacarpi magnum in three particulars:—first, in being about one-sixth longer; secondly, in its body being much rounder; and lastly, in the articulatory surface upon its head being such as is adapted to the ossa cuneiformia.

The ossa suffraginis, coronæ, pedis, et naviculare, bear a close resemblance to each other, both in the fore and hind extremities.

Diseases of the Bones of the Hock.

Few parts of the skeleton are more subject to disease than the hock. It presents us with examples of such a vast variety of exostosis, as well as anchylosis, that to attempt to particularize them, would be quite an endless task. Nor is this, indeed, a matter of surprise, when we

consider how much this joint, beyond all others, is exerted during progression; for it is very principally upon it, that the strong muscles about the quarters, employed for that purpose, exercise their powers in the propulsion of the machine.

As most of these diseases affect the inner part of the hock, where they appear in the form of exostosis, we shall describe them, according to established usage, under the general head of *spavin*.

On Spavin.

The word *spavin* has been applied to several diseases of parts about the hock-joint, not only distinct, but even opposite in their nature, prefixing to it, by way of diagnostic, the epithet *bog*, *blood*, or *bone*, according to the supposed nature of the malady. Nowadays, however, we seldom use the term except to denote the last of these affections: the two first having their origin in extremely erroneous notions, are pretty generally discarded among professional men. We would define a spavin, (called by horse-dealers and grooms a *jack*,) to be an exostosis upon, or near to, the inner and lower part of the hock. In its origin and progress it is very similar to a splint; indeed, it may be, in reality, purely a splint; although from its situation, we should denominate it a spavin. To explain this, a spavin may, and commonly we believe does, arise from an inflammation of the cartilago-ligamentous substance connecting the head of the inner small metatarsal to that of the cannon bone, without any accompanying disease of the bones of the hock; and this, terminating in ossification, may be a splint as to its nature, but is a spavin as to its situation. If, however, the inflammation extends from this cartilago-ligamentous

substance to the ligaments and bones of the hock, and terminates there in the effusion of bony matter; or if the exostosis of the inner metatarsal bone itself is so placed as to disturb the motions of this joint, then does a spavin differ essentially from a splint. To elucidate this point still farther—if the exostosis, instead of making its appearance just beneath the hock, is seated about the body, or lower extremity of the cannon, it constitutes a splint of the hind leg: a disease however of but rare occurrence, owing to the bony deposit commonly appearing at that part where inflammation is first excited.

Although a spavin at the commencement may be confined to the metatarsal bones, it seldom happens that those of the hock do not ultimately partake of the disease; and this will account for the various degrees of lameness and stiffness observable in that joint: indeed, we have little doubt but the internal parts—the vascular lining of the joint—become eventually diseased; so that the synovia is unnatural either in quantity or quality, or perhaps both; to which is chiefly referable the explanation of the fact of spavined horses improving in their action during work. In almost all cases of inveterate spavin, the cuneiform bones are united together by a layer of ossific matter, extending upwards from the inside of the large and inner small metatarsals; so that there is no longer any motion whatever between the small bones of the hock and those of the leg: very commonly also, the same sort of union renders the os calcis as well as the os cuboides fixed in their places. However much the exostosis increases in size after this, it seldom invades the joint formed between the astragalus and tibia; so that, in fact, the chief motion of the hock is still preserved; and in consequence of it, such horses are able to go with very tolerable freedom. But when

this joint, in which almost all the motion of the hock resides, becomes diseased, the event is either partial or (if the case be neglected) complete anchylosis: and now the lameness is so excessive that the horse is either altogether useless, or only fit for slow and moderate work. And not unfrequently such horses derive benefit from well-regulated exercise in harness, in consequence, probably, of some absorption of the bony deposition, from the repeated pressure and friction it is exposed to, in the forcible exertions of the hock during draught: hence it is that ploughing, and other agricultural labor are esteemed *palliative* for horses that are cripples from this disease.

We have mentioned the *inside of the hock* as the seat of disease, in our definition of a spavin; for were a similar swelling to take place upon the outer, we are not quite sure whether it would be so called or not. The truth is, however, that such appearances are exceedingly uncommon, and for the same reason that splints are much more frequent on the inside of the leg than the outside: *viz.* the greater proximity of these parts to the centre of gravity, and the position of the small bones of the hock with regard to those of the leg. So that, from both these causes, the inner metatarsal bones actually support more weight than the outer; their elastic connexions, therefore, are more likely to be sprained, (as well as the ligaments of the inside of the hock,) and to take on inflammation, and ossification.

We have anticipated what may be said to link all the causes of spavin to one as a principal: *viz.* any thing that excites inflammation of the ligamentous parts in the situation of it; be it over-exerting, over-weighting, or otherwise injuring them. Hunters are often spavined, because they sprain their hocks in leaping and galloping upon

heavy ground; military horses are often spavined, because they are made to use these parts with violence, and in various unnatural movements; young horses are often spavined, because they are put to work before their limbs have acquired due firmness and strength. Need we particularize further?

In a work on the *Diseases of Horses* *, written more than sixty years ago, we find the following pertinent remarks about the *kinds* of spavin: "that which begins at the lower part of the hock is not so dangerous as that which appears higher between the two round processes of the leg bone. Likewise a spavin near the edge, is not so bad as one that is more inward towards the middle, because it does not so much affect the bending of the hock. It may also be observed, that a spavin that comes by any common accident, as a kick or a blow, is at first no true spavin, but a contusion; and therefore not so dangerous." —These practical conclusions, the truth of which is confirmed by every day's experience, admit of ready explanation on the principles we have laid down.

In almost all *systems of farriery*, is met with a *cure* for *bone* spavins. The remedies made use of for this purpose are of three kinds: the first removes the tumor by a mechanical operation; the second, by destroying its vitality, and causing exfoliation; the third, by exciting inflammation and absorption of it, on the principle of counter-irritation. Though any of these may diminish lameness, or take off the tumor, not one will eradicate the disease—a disease that, like splint, essentially consists in the destruction of a part the original texture of which nothing we

* *A New Treatise on the Diseases of Horses, &c.* by WILLIAM GIBSON, Surgeon.

can employ has the power to restore. Knowing that the small metatarsal bones are of the same use in the hind as the small metacarpal are in the fore extremities, it will at once occur how preposterous it is even to suppose that Nature should re-convert that whose composition she has before changed, because its strength was insufficient to sustain the force exerted on it. In truth, therefore, there is *no* cure for a splint, or a spavin; and though the lameness caused by it may admit of removal, or palliation, according to the circumstances of the case, it is equally certain, that that horse in which it has once formed, must perceive through life a degree of concussion, if not inconvenience, in action he never experienced before.

Notwithstanding our confessed inability to cure this disease, we are often called on to treat it; either for the purpose of alleviating the accompanying lameness, or of removing, what is regarded as, a troublesome and unseemly eye-sore.

With regard to operating on spavins, with a view to remove them by means of a chisel, file, or saw, although the practice is exceedingly commendable in cases of common exostosis, it is not so well adapted to this disease: those who employ such means, seldom fail to leave the parts ultimately in a worse state than they found them in. The reasons are obvious. So much mechanical injury is inflicted, and unavoidably so, upon the joint, that fresh inflammation, generally of a more aggravated nature, is excited by the operation; which, from the texture of the parts it invades, commonly ends in spavin or exostosis, if not so large, of a much worse description than that attempted to be taken off; inasmuch as it extends more over the cavity of the joint, and interferes so much the more with its motions. So that, at the

best, this operation can only reduce the size, or prominence of the tumor; but, at the same time, it will, almost invariably, we believe, augment the osseous deposit internally, and increase the lameness. By farriers who pretend to *cure* spavins in this way, the operation is so bunglingly done, that the hock-joint is not unfrequently opened; a circumstance now and then followed by the animal's death: be it performed however ever so skilfully, the animal is subjected anew to pain, to be, with but few exceptions, rendered lamer than he was before.

The practice of destroying spavins with caustic is objectionable for the same reasons: the remedy here, as in the case above, is even worse than the disease it is intended to relieve*.

Our most successful remedies, and those whose use is attended with the least inconvenience, are such as come under the denomination of counter-irritants. Stimulants of various kinds have been from time to time recommended: the old favourite, and one that is now occasionally employed, is the ol. origani; an essential oil well known to farriers as an irritant when rubbed upon the skin; common turpentine, liniments of various descriptions, and mercurial ointment have been also, at one time or other, made use of. Nothing, however, succeeds so well as repeated blisters over the diseased part: let the hair be closely shorn off the tumor; then spread thinly upon it the unguentum lyttæ, and repeat it every week, or fortnight, according to the demands of the case. Should

* Speaking of caustics, disguised in blisters, GIBSON says, "I have seen many recipes of this kind that have been tried with various success, but for the most part they leave a continual baldness, and often *a remaining stiffness, which can never be removed.*" This, we apprehend, is partial anchylosis.

this fail, (which it but seldom will,) firing may be had recourse to; but not deep firing, lest we slough beyond the integument, and increase, instead of relieve the disease. If the swelling be so recent that we can detect its existence in a state of callus—prior to ossification, (a discovery that we are not very likely to make,) we may take a quart or two of blood from a superficial vein passing obliquely over the anterior part of the hock, by puncturing it a few inches higher up, and follow the venesection up by the immediate application of a blister: no practice is so beneficial as this, when there is much perceptible heat and tenderness of the part.

Another mode of employing counter-irritation is by seton. This remedy has been revived at the Veterinary College, and the assistant professor informs us, with manifest advantage. Its success having shewn itself in two or three cases which had resisted the ordinary treatment, many others were operated on; and the practice has so far justified itself, as to be preferred to any other. The operation is easily performed. Incisions through the skin being made with a lancet, above and below the spavin, insinuate a piece of tape between the integument and the periosteum, with a blunt seton-needle. We may excite more inflammation in the part afterwards by besmearing the seton with common turpentine, or other irritating application. We have no opinion of our own to offer on this subject, not having as yet made sufficient trial of the remedy: we leave the case therefore as it is, and trust that those who are vigilant in the promotion of the art, will not fail to inquire into the merits of it.

LECTURE XXII.

Bones of the Head.

THE bones of the head are divided into those of the cranium, and those of the face: we shall first describe the

Bones of the Cranium.

THE cranium, skull, or brain-case of the horse, is but small when compared to the bulk of his body: it forms the upper part of the head; is prominent and convex exteriorly, and hollow and vaulted within, for the purpose of lodging the brain and its appendages. The bones of which it is composed vary much in the thickness of their laminæ, and do so according to their situation; those being thickest and strongest whose exposure is greatest to external injury. They are nine in number; three pairs, and three single bones: *viz.* ossa frontis, ossa parietalia, ossa temporum, os occipitis, os sphenoides, os ethmoides.

Prior to speaking of these bones separately, it will be right to point out the different sutures by which they are united. The *sutures* are those seams, or marks upon the head, running in various directions, which define the limits of each individual bone. One of the most conspi-

cuous is the *frontal suture ;* so called because it connects the ossa frontis. A continuation of the frontal suture upwards, between the ossa parietalia, seldom so well marked as the frontal itself, forms the *sagittal* or *parietal suture :* it is often bifurcate below, and sometimes double through its whole course. Occasionally it is altogether wanting. The *coronal suture* is of a waving or serpentine figure : it divides the ossa parietalia from the ossa frontis. The *lambdoidal suture* separates the ossa parietalia from the os occipitis : those parts of it which are situated between these bones and the petrous portions of the ossa temporum, receive the name of *addimenta suturæ lambdoidalis.* The *squamous sutures* divide the squamous portions of the temporal from the frontal and parietal bones. Most of the sutures are subject to some variation in different heads ; among the most uniform in their appearance are the frontal and coronal. In order to have a correct knowledge of them, we should procure a young head ; for as the animal advances in years, many of them become indistinct, and of some the traces are altogether effaced. In the aged horse, ossific union of the bones has so completely obliterated them that not a vestige of suture remains : the sagittal suture soonest disappears ; the frontal remains the longest; though even it, we have remarked, has been scarcely visible in the skull of a horse seven years old.

Ossa Frontis.

The frontal bones, two in number, form that part of the cranium which we distinguish as the fore-head, and which, in the living horse, is commonly marked by a white patch of hair, designated a star. Their external surface is smooth and convex ; prominent above, to give more

space to the brain; flat below, in the situation of the frontal sinus. Projecting from its outer margin is a portion of bone, of an arched figure, called the external orbitar process; so placed as to form the upper and anterior part of the orbit. Below this, and behind it, is a thin bony plate, named the internal orbitar process; partially divided from one of similar structure above by a considerable inlet, into which a part of the ethmoid bone is received. Thus, the orbitar processes of the os frontis contribute a great share in the composition of this bony cavity, called the *orbit*, designed for the lodgment of the organ of vision. The inferior extremity of this bone, takes the name of nasal process. The thin plate of bone above the orbital, is the temporal process. Upon its interior, the os frontis is divided by a vaulted piece of bone into two unequal cavities: the superior contains the anterior lobe of the brain, which is partly supported by this partition; the cavity below, known by the name of the *frontal sinus*, is of less size than the cerebral, though its extent is greater than, on a superficial view, it appears to be, in consequence of its running for some way up in front of the partition. One frontal sinus is separated from the other by a septum, composed of a lamina from each bone. There is but one hole (sometimes notch in the dried bone) in the os frontis, and that at the root of the orbitar process: it is called the foramen supra-orbitarium. The ossa frontis are connected above to the ossa parietalia; on either side to the ossa temporum, both by their temporal and orbital processes; and to the ossa sphenoides et ethmoides within the cavity of the orbit. They are also joined to some of the bones of the face. It is of some importance to carry in mind the precise spot where the perforation should be made in the head

when it becomes necessary to *open the frontal sinus.* First we feel (in the living horse) for the internal angle of the orbit—the part pierced by the infra-orbitary foramen, then drawing an imaginary line to the same point on the opposite side, we may safely make an opening at any point in the course of it, within half an inch, or an inch, of the frontal suture: a puncture made one inch higher would endanger the brain, and one an inch and a half lower would enter the nasal sinus. For this operation a well made *spill-gimblet* is as good an instrument as can be used. A perforation through the anterior part of the internal orbitar process, will also open into the frontal sinus. These cavities communicate below with others to be hereafter described.

Ossa Parietalia.

The parietal bones, two in number, constitute the upper and lateral parts of the cranium. They are of a square figure: each somewhat resembles the shell of a crab. It is smooth and regularly convex externally; but concave and uneven internally; being there marked by the convolutions of the middle lobes of the brain, which it covers and protects. The sides of these bones are jagged, and extremely uneven; and, with the exception of those overlapped by the squamous portions of the ossa temporum, their edges are denticulated, so as to form *true* sutures when united with those of other bones of the skull. They are joined to each other in the centre. Their lower parts are connected to the ossa frontis; their sides to the ossa temporum; and their upper borders to the os occipitis. These bones have no remarkable foramen: though some small holes are formed by their union with the temporal bones.

Ossa Temporum.

The ossa temporum are, in truth, *four* in number; for those pieces which correspond to the squamous and petrous portions in the human subject, are in the horse separate bones, and remain so during life. They are situated on either side of the cranium, behind the orbital cavities. The squamous portion is that which overlaps the sides of the parietal bone, and forms a part of the zygoma, or bony arch: the petrous, that to which the ear is attached, and which contains the internal organ of hearing. We shall first speak of the former.

Pars Squamosa,

Or squamous portion, consists chiefly of a circular plate of bone, convex upon the outside, concave within, to adapt itself to the middle lobe of the brain, from which are proceeding several projections. The most conspicuous is the zygomatic process, which extends downwards in a curved direction to form a junction with the orbital processes of the frontal and malar bones, and complete the upper and outer boundary of the orbit, over which these three projections are extended in the form of an arch: hence the name of zygomatic arch has been given to it. A thin portion of bone is sent off from the root of the zygomatic process, which may be denominated its occipital process; and between these two projections, a round prominence passes downwards, which, from its resemblance to the mamma or teat of an animal, is called the mammillary or mastoid process. Anteriorly to the mastoid process is the glenoid cavity; a superficial smooth hollow, intended for the reception of the condyle of the lower jaw. At the root of the mastoid process is a small foramen, called the foramen

mastoideum. The squamous portion is connected inferiorly to the os frontis; posteriorly to the os sphenoides; superiorly to the os occipitis, and pars petrosa; and anteriorly to the ossa parietalia.

Pars Petrosa,

Or petrous portion, is united with the posterior and upper part of the squamous: it is important from containing the delicate parts of the internal ear. From its lower end is sent off a thin, sharp process, called the styloid. Every where this bone is extremely hard in its composition; though internally it is hollow; where are deposited, we repeat, those complicated little organs necessary to the production of hearing. The passage leading to this, is called the meatus auditorius: its bony beginning, to which the external ear attaches itself, is marked by a large foramen surrounded by a bony eminence, denominated the auditory process. A slender portion of this bone runs upwards and backwards, between the pars squamosa and os occipitis; which not unfrequently separates by maceration. This bone has a slight connexion to the os sphenoides.

Os Occipitis.

The occipital bone in the young subject is divisible into two pieces; but ossific union is completed between them in the adult horse. The upper portion, by some called the *anterior occipital bone,* is of considerable substance; for being placed at the vertex, it is a part much exposed to external violence: the summit of the head generally receives the blow when a horse falls backwards in rearing. It is somewhat arched in its shape; being convex externally, and concave internally, to cover, and

shield from injury, the posterior lobes of the brain. The upper protuberant part, forming the vertex, may be called its tubercle: into it is inserted the ligamentum nuchæ. This bone is connected with the ossa parietalia before; with the os occipitis posterius behind; and on each side with the petrous portions of the ossa temporum.

The lower piece, or *posterior occipital bone*, is very different in its general appearance from the anterior; and exceeds in thickness, as well as strength, most of the other bones of the cranium: it forms that part of the skull which is articulated with the bones of the neck. Five processes, and three foramina, are distinguished in this bone. Through its middle is a large circular hole, called the foramen magnum. By the sides of it are two rounded articulatory eminences, named the condyles or condyloid processes, which form joints with corresponding concavities in the first cervical vertebra. Further removed outward from this foramen, project two others, called, from their hooked figure, the coronoid processes: they are directed backwards, and tend much to prevent displacement of these parts in the living animal. From the lower part of this foramen extends forward a remarkably strong rounded portion of bone, supposed to resemble a wedge, hence its name of cuneiform process: it assists in supporting the brain, and forms one of the strongest barriers at the basis of the skull. The foramen magnum lodges the origin of the spinal marrow. The two remaining perforations are those through the roots of the condyloid processes, denominated the foramina condyloidea. This bone is joined above to the last described; below to the os sphenoides, by means of its cuneiform process; and laterally to the ossa temporum.

Os Sphenoides.

The sphenoid bone is placed at the posterior part or basis of the cranium. In shape it has been compared to a bat with its legs and wings extended; from which circumstance a division of its several parts has been made into body, alæ or wings, and crura or legs. The body, a firm and solid piece of bone, is of a cylindrical form; convex and smooth upon its back part; irregularly concave upon its fore or internal part, upon which lies a portion of the brain. From the sides of the body are extended two broad and thin bony plates which correspond to the wings, hence called its alæ; whose extremities are seen in the posterior parts of the orbits. They are hollowed out and smooth internally, in order to enlarge the cavity of the cranium, and assist in giving protection and support to the brain. From the roots of the alæ anteriorly proceed the crura or legs, two long slender processes which embrace the sides of the os ethmoides: at their junction with the alæ are two foramina. The os sphenoides is connected inferiorly to the os ethmoides; superiorly to the ossa temporum, et occipitis; within the orbits to the ossa frontis, temporum, et ethmoides.

Os Ethmoides.

The ethmoid bone, perhaps, more resembles a bat in flight than the last described, if we suppose that the legs have been taken away, and a head and neck added. It is situated at the basis of the skull, before the os sphenoides; and is greatly concealed from our view by the vomer, the broad part of which lies immediately upon it, in the form of a crescent. Its body, unlike that of the sphenoid, is hollow; being composed of thin delicate plates of bone,

so disposed as to form two small cavities, called the *ethmoidal sinuses :* these freely communicate, and discharge their secretions by small apertures into numerous little cavities called the *ethmoidal cells,* which open into the chambers of the nose. From the upper and fore part of the body runs a process which some have compared, in the human subject, to the comb of a cock, and given it the name of crista galli. Two thin expansions of bone from its sides, more deserve the name of alæ than the processes so called of the sphenoid bone ; their terminations, which are extremely thin and form a part of the posterior boundaries of the orbits, have been denominated the ossa plana. Around the crista galli is an exceedingly thin, spongy portion of bone, which fills up two oval vacuities left at this part, between this bone and the posterior portions of the ossa frontis : this, from the peculiarity of its structure, has been named the cribriform plate—through its numerous perforations are transmitted the filaments of the olfactory nerves to the membrane of the nose. At the roots of the alæ are two round foramina, called the optic, from giving passage to the optic nerves. The os ethmoides is connected superiorly to the os sphenoides ; inferiorly to the vomer et ossa turbinata ; within the orbit to the ossa frontis, palati, et sphenoides.

LECTURE XXIII.

Bones of the Face.

THE bones of the face, like those of the cranium, are united together by sutures, which have received different names according to their situation: they all become more or less indistinct, and many totally obliterated, in the old horse's head. The only two we shall notice in this place, are the transverse and nasal sutures. The *transverse suture* runs from the inner angle of each orbit across the forehead, and is continued within the orbits, in a zigzag course, as far as the os sphenoides: it marks the line of junction between the bones of the face and those of the skull. The *nasal suture*, a continuation of the frontal, unites the nasal bones: it is seldom effaced in the oldest horses.

The bones of the face compose the upper and under jaws: the upper jaw is separable into eight pairs, and one single bone; the lower (formed in the foal of two) is but one piece in the adult horse.

Ossa Nasi.

Two long slender bones, situated upon the fore part of the face, immediately below the forehead; where they

form a vaulted roof to the cavity of the nose. Their upper edges are ragged and serrated, and make a zigzag suture by their union with the ossa frontis: nearer to the orbits, a less denticulated suture joins them to the ossa malarum. Their sides are overlapped by the ossa maxillaria superiora; and in the centre they are united by the nasal suture, to which part is firmly attached the septum nasi. These bones, viewed either separately or articulated together, are of a wedge-like shape, being broad and expanded above, but thin and tapering below, where they terminate in sharp pointed extremities; parts conspicuous in the dried skull, in consequence of the nostrils (which are supported by them in the recent subject) being composed of soft materials. Upon their exterior the nasal bones are smooth, and irregularly arched; so that the internal part, by being hollow, increases the area of the cavity of the nose. Opposite to the basis, is a cavity that will contain about half an ounce of fluid, to which the name of nasal sinus has been given. Below it, the bone is scooped out, and divided by an irregular projecting ridge into two furrows, or canals; the inner of which, the larger, is the passage from the frontal and nasal sinuses to the chamber of the nose; the outer is occupied by the superior turbinated bone, whose ossific adhesion to the central ridge between the grooves is so firm, that it is not separable by maceration. In addition to the connexions of the ossa nasi we have already described, their edges are embraced on either side in part by the ossa maxillaria inferiora; between which and their apices is a remarkable vacuity, filled up in the living horse by the different soft parts entering into the composition of the nares externæ.

We would remark, in this place, that the frontal sinuses empty themselves in part into the nasal, but from the latter there is no meatus or passage whatever; consequently, it is only when they overflow from the collection of secretion, or in certain positions of the head, that discharge will trickle from them into the chambers of the nose.

Ossa Unguis.

Two small bones placed below the orbits, to the outer side of those last described. Each os unguis may be said to be composed of two plates, or laminæ: a facial, that portion which contributes to the upper and lateral parts of the nose; and an orbitar, which assists in forming the floor of the orbit. The latter is so thin as to be transparent when held to the light, and is remarkable from containing a bony canal, lined by membrane in the recent subject, denominated the ductus ad nasum; whose use is to conduct the tears from the eye to the cavity of the nose. The ossa unguis are joined above, both within and without the orbits, to the ossa frontis; laterally, in the same manner, to the ossa malarum; and inferiorly to the ossa maxillaria superiora.

Ossa Malarum.

Two bones shaped like crescents; whose smooth lunated borders form the outer boundaries of the orbits. This is a bone of more than ordinary thickness, particularly at its upper and outer part, where it is lengthened out into a conical projection, called its zygomatic process; in consequence of its contributing to the formation of the zygomatic arch, which it stands out to support after the manner of a buttress. Its body rests upon the superior

maxillary bone. From its orbitar edge proceeds a smooth excavated bony plate, let into the parietes of the orbit. Its interior presents a rough laminated surface, firmly dovetailed with the os unguis.

Ossa Maxillaria Superiora.

These are, with the exception of the lower jaw, the largest bones of the face; and constitute a very considerable part of the upper jaw. Though much thicker in substance than those that complete the jaw below, (which we shall next describe,) they are not of so firm a texture, nor of such absolute strength. That part connected superiorly with the os malæ, is denominated its malar process. Behind it, is a rounded protuberance, near to the last molar tooth, called the tuberosity. The projection from its lower extremity, the dental process, is extensively connected, along its upper edge, to the os maxillare inferius. The posterior part of this bone, its alveolar process, is composed of two bony plates, or laminæ, intersected by thin osseous partitions in such a manner that quadrangular cavities are formed between them, for the purpose of containing and supporting the molar or grinding teeth: these sockets, or alveolar cavities, vary in size and number according to the age of the animal. From the alveolar pass inwards the palatine processes; two vaulted projections, which, by their union, form the roof of the mouth, or bony palate. Upon their fore part, where their laminæ again unite, the maxillary bones become comparatively thin: along this (their anterior) edge, they are connected to the ossa nasi; so that these bones constitute a great share of the parietes of the nose, whose superficies they extend by being excavated upon their interior. The

nasal cavities are further enlarged by two capacious chambers, called the maxillary sinuses, or antra maxillaria: not however that they are, strictly speaking, situated within these bones; for both the ossa unguis et malarum assist in their formation; indeed the orbitar plates of these bones constitute the roof of the sinuses; so that in order to open them, we should make perforations some little distance below the inferior borders of the orbits. They communicate freely with the frontal sinuses, and empty themselves into the nose by the sides of the ossa turbinata. Just below the site of this sinus externally is a hole of large size, denominated the foramen infra-orbitarium, through which passes a large branch of the fifth pair of nerves. Between the palatine process and the os palati, with which it is connected, is another hole of smaller size, called the foramen palatinum. Besides the connexions which have already been noticed, the ossa turbinata inferiora adhere to these bones, within the cavity of the nose.

Ossa Maxillaria Anteriora.

Two bones remarkable for smoothness of surface, and hardness of texture, composing that part of the upper jaw to which the upper lip is attached: they do not exist in the human subject; we have only two upper maxillary bones, which, by forming a junction with each other in the centre, called the symphysis, of themselves constitute the upper jaw. Each of these bones may be divided into a body and two projections: the body, the thickest and lowest portion, is formed of two laminæ or plates, between which are cavities for the incisor teeth, or nippers; similar in construction, but not in shape, to the sockets

that contain the grinders, and, like them, differing in size and number in the young and adult animals. Below they are united to each other, in the young subject by cartilage; but in the old by osseous matter, so that they are commonly inseparable by maceration: this part is known as the symphysis of the upper jaw. From the body extends upwards a projection of considerable length, which together with its fellow of the opposite side, from which it diverges in course, leaves an oval-shaped opening of considerable size, through which we can examine the interior of the bony fabric of the nose; the figure of the oval is, however, broken in upon superiorly by the tapering extremities of the ossa nasi. From the upper and back parts of these bones are sent off two extremely thin and transparent laminæ, which fill up the space in the roof of the mouth between the dental processes of the superior maxillary bones. Beside the connexions just mentioned, the anterior maxillary bones are joined above to the ossa nasi. Through the centre of the symphysis is a perforation, called the foramen incisivum: it affords passage to the extreme branches of the palatine arteries, in their course to the upper lip.

Ossa Palati.

These bones are so named from composing a part of the palate; though they contribute to it very inconsiderable portions, when compared to the broad arch formed by the palatine processes of the superior maxillary bones. They are firmly retained in their places at the top of the bony palate by those bones; indeed, they are so securely locked in, that it is with no small difficulty their separa-

tion is effected in the macerated skull. Between the upper parts of the nose and mouth (for they enter into the composition of both) the palate bones present a smooth curvated edge, to which the velum palati or soft palate is attached. Still higher they form a small share of the orbital cavities, at which part there is a foramen on each side, called the foramen palatinum superius, leading to the palato-maxillary canal: it gives passage to the palatine artery. The lamellæ of which this bone is composed, having disunited, leave a smooth, oblong cavity between them, which completes posteriorly, and something enlarges, the maxillary sinus. Near to its lower end is a notch continuous with a bony fissure: this is the termination of the palato-maxillary foramen. The ossa palati are connected with the ossa ethmoides, sphenoides, et frontis above; centrically with the vomer; laterally and inferiorly with the ossa maxillaria superiora.

Ossa Spongiosa vel Turbinata, Superiora et Inferiora.

The spongy or turbinated bones are four in number. They are more delicate than any we have noticed, being composed of extremely thin, porous, flexible laminæ, the texture of which (when exposed to the light) resembles that of crape, or muslin, perhaps, more than any thing else we can compare it to, convoluted or rolled up into a form not unlike a turban; hence the epithet *turbinata*. These bones, concealed from view, are situated within the interior of the nose, to the bony parietes of which they closely adhere. We have, at another time, described the superior turbinated bones (which are two in number) as inseparably connected with the ossa nasi; it therefore only remains for us to point out the attachments

of the two inferior. These are united superiorly to the ethmoid cells, and so intimately, that by some they are considered as part of that bone; they are also joined to the sinuses of the frontal bones, with which they have free communication; but they are principally retained in their situation by their connexions with the ossa nasi, through the interposition of the anterior spongy bones.

The spongy bones materially augment the faculty of smell, by affording a very extensive surface for the ramification of the olfactory nerves upon the pituitary membrane, in which they are enveloped. They are not unfrequently in part destroyed by caries in the malignant stages of glanders.

Vomer.

One of the single bones of the face. It bears some resemblance to a ploughshare, whence it takes its name. It is placed upon the arch of the bony palate, and in many places becomes pretty firmly adherent to it by osseous matter. This bone is constituted of two thin sides, with a deep groove between them; into which the posterior margin of the cartilaginous septum of the nostrils, is, in the fresh head, nicely fitted. Above, the vomer is expanded, and terminates in the form of a crescent; where it is closely embraced, and retained in its situation, by the ossa palati: the space within its lunated edge exposes to view a small part of the os ethmoides, with which the vomer is also connected.

Maxilla Inferior vel Posterior.

The inferior maxillary bone, more commonly called the lower jaw, we shall divide, in our description of it,

into body, sides, and branches. The *body* is that part corresponding to the human chin, and has in its lower end six alveolar cavities, for the incisor teeth, and in the adult male two others in its sides for the tushes. The *sides* consist of two broad firm pieces, flattened laterally, rounded posteriorly, and hollowed out in front for the reception of the molar teeth; and the alveolar sockets in them are formed by the separation of the plates of which this bone is composed, partitioned by transverse osseous septa. From the upper and back part of the bone project forward the *branches*, which are thinner in substance, but somewhat broader than the sides. Each branch is surmounted by two processes: the anterior, from its resemblance to the beak of a crow, may, with propriety, be named the coronoid; the posterior, which articulates with the glenoid cavity of the temporal bone, the condyloid process or condyle. There are two foramina, one in each side of this bone, which communicate, by a canal that runs by the roots of the molar teeth, with two others in the body: they may be called the superior and inferior maxillary foramina.

Diseases of the Bones of the Head.

THESE parts are occasionally fractured from blows or falls: both being accidents, however, of but rare occurrence, and too variable a nature to admit of much practically useful description, or any defined method of treatment, we shall leave them, with a solitary remark, to the discretionary management of the practitioner:—replacement and apposition of the fractured parts, and the prevention of all motion between them, are the primary and leading considerations.

Exostosis is not common about the head: we have seen it oftenest upon the lower jaw; indeed, this bone is sometimes met with considerably augmented in thickness from adventitious deposit upon its sides. We have but one preparation of exostosis of the upper jaw: it is about the size of an egg, grows from the orbitar process of the os frontis, and is so placed as to intercept those rays of light falling direct upon the eye.

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OBSERVATIONS

ON

THE CONSTITUTION, ECONOMY, AND DEFECTS

OF THE

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OF

GREAT BRITAIN:

ACCOMPANIED WITH

PLANS OF AMENDMENT.

ADDRESSED,

With all due Submission and Respect,

TO THE

PRESIDENT, VICE-PRESIDENTS, SUBSCRIBERS, AND MEMBERS

OF THE

VETERINARY COLLEGE.

AMONG other topics, the Work will embrace.—The Rise and Progress of the Veterinary Art.—The Veterinary College, considered as a National Institution, and Public School: The Professor, and the Assistant Professor.—The Improvement of the Art: Authors, Writers, Discoverers, and Patentees.—Present dormant state of the Art: Obstacles to further Advancement.—Army Veterinary Establishment: The Principal, and the Regimental Veterinary Surgeons; Supply of Medicine; Veterinary Regulations.—Plans for augmenting and extending the Utility of the Art, and for ameliorating the Condition of its Members.